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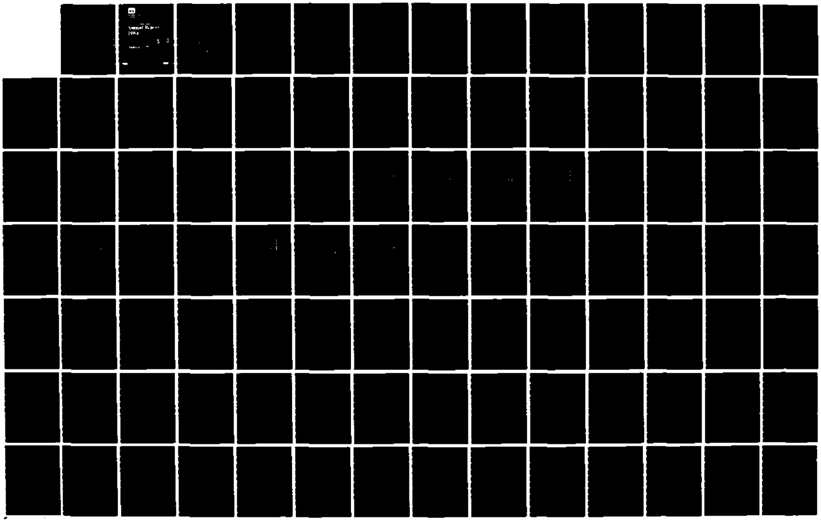

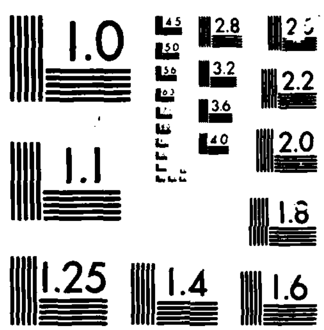

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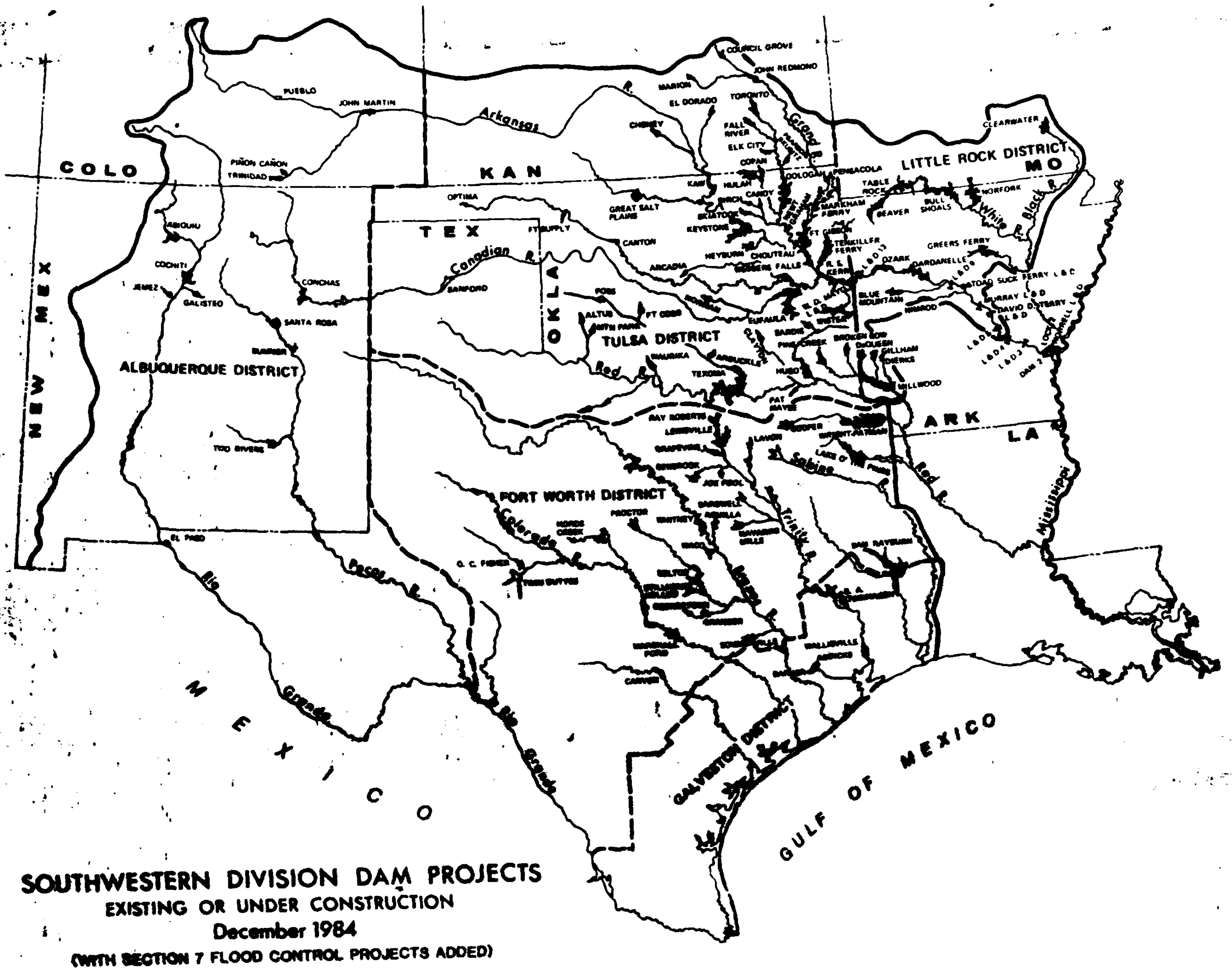
US Army Corps of Engineers
Southwestern Division
Reservoir Control Center

Annual Report 1984

January 1985

THE PACESETTER DIVISION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SANTA ROSA
TWO RIVERS
EL PASO
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SANFORD
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MARKHAM FERRY
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SOUTHWESTERN DIVISION DAM PROJECTS
EXISTING OR UNDER CONSTRUCTION
December 1984
(WITH SECTION 7 FLOOD CONTROL PROJECTS ADDED)

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (*When Data Entered*)

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Water control manuals
Water quality activities
Sediment activities
Data collection and management
Water control automated data system

20. ABSTRACT (*Continue on reverse side if necessary and identify by block number*)

This report presents activities and accomplishments of the Southwestern Division (SWD) as related to reservoir regulation and water management activities for fiscal year 1984. Also presents detailed summaries of reservoir conditions, water quality activities, and coordinating activities with other Federal and non-Federal basin interests groups.

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1984

ANNUAL REPORT

RESERVOIR CONTROL CENTER

SOUTHWESTERN DIVISION

PLATE

Dams and reservoirs in the Southwestern Division Inside Front Cover

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3. HYDROLOGIC ENGINEERING CONFERENCE

RESERVOIR CONTROL CENTER

1984 ANNUAL REPORT

SECTION I - INTRODUCTION

SECTION I - INTRODUCTION

1. **PURPOSE OF REPORT.** This report presents activities and accomplishments of the Southwestern Division (SWD) as related to reservoir regulation and water management activities throughout FY 1984. Detailed summaries of reservoir conditions, water quality activities, minutes of coordinating committee meetings and minutes of the annual RRC meeting and the Hydrologic Engineering Section meeting are also included.

This report is prepared in conformance with ER 1110-2-1400, 24 April 1970, Reservoir Control Centers, paragraph 12c.

2. **REFERENCE.** Reservoir Control Center (RCC) - SWD Guidance Memorandum, dated June 1971, approved by the Chief of Engineers as a general basis for the RCC's activities.

3. **OBJECTIVES OF THE RESERVOIR CONTROL CENTER.** The SWD RCC was established in 1967 by the Chief of Engineers to improve capabilities of the Corps of Engineers to perform its civil works mission as related to operation of reservoirs. The SWD RCC carries out its responsibilities by:

a. Organizing coordinating committees and/or participating in committees to accomplish mutual understanding among water interests regarding use and regulation of water resources.

b. Providing interbasin coordination of day-to-day regulation needs for river systems for all purposes.

c. Surveillance of daily operations and continuous analysis of project needs.

d. Furnishing technical assistance to personnel of district offices in related efforts to improve the reliability of regulations and hydrologic determinations.

SECTION II - WATER CONTROL ACTIVITIES IN SWD

SECTION II - WATER CONTROL ACTIVITIES IN SWD

1. RESERVOIR REGULATION

a. Lake Regulation During FY 84. Lake regulation activities for Division lakes and Section 7 lakes during FY 84 are summarized in Section VI of this report. Operational data summaries for all of the SWD projects, including Section 7, are shown in tabular form, two projects per page in Section VII. An index, by basin, to these tables is included which also lists pertinent data for each project. Also included is a listing in alphabetical order giving names of both the lake and dam where different.

b. Regulation Plans. The approved plans of regulation developed in 1975 for the reservoirs of the Trinity River Basin are being evaluated using the SWD reservoir regulation simulation computer model. A base run was made with this regulation criteria to establish existing conditions for comparison with future condition runs and alternative regulation plans. Additional runs made this year included (1) an updated water supply demands run (2) planned channel improvements to Denton Creek and the Elm Fork of the Trinity River run and (3) a natural conditions run. All of these runs included economic values that were adjusted to current conditions.

c. Water Control Manuals. A summary entitled "Status of Water Control Manuals in SWD is included in Section IV of this report. The summary shows the status and completion schedule through FY 1987 for manuals on 117 lakes and 16 river systems and subsystems. At the end of FY 1984, there were 93 Corps of Engineers projects (76 lakes and 17 locks and dams) and 16 Section 7 lakes in operation in SWD.

During FY 1984, the SWD Reservoir Control Center received and reviewed seven water control manuals that were submitted by the districts in the form of new manuals, revisions to old manuals and plans. The schedule for FY 1985 includes the development of five new manuals, the revision of manuals for three projects and two project plans.

d. Section 7 Project Regulation. Within SWD there are 16 existing reservoirs owned and operated by other agencies. Presently the Bureau of Reclamation is constructing two additional reservoirs. McGee Creek Dam to be located on Muddy Boggy Creek, a tributary of the Red River, and Brantley Dam to be located on Pecos River. The flood control storage contained in these projects are regulated by the Corps in accordance with Section 7 of the Flood Control Act of 1944. The districts are continuing their efforts to bring the manuals and regulation plans into compliance with requirements contained in paragraph 208.11, Part 208 Flood Control Regulations, Chapter II, Title 33 of the Code of Federal Regulations (41 FR 20401, May 18, 1976). Due to the varied approaches between the districts on real time regulation for Section 7 projects, SWD issued a policy letter on 21 March 1983. The purpose of the letter was to supersede previous SWD guidance and to provide current policies on Section 7 projects. The letter also instructed the districts to begin coordinating these policies with project owners in an expedious manner in order that water control manuals for existing reservoirs can be finalized within the next two years.

2. SOUTHWESTERN DIVISION WATER QUALITY PROGRAM AND ACTIVITIES.

a. **Responsibilities.** The Water Management Branch is assigned the responsibilities to coordinate and direct activities in SWD in the water quality field. This provides for water quality objectives being included as an effective part of our total water management program. Specific activities in the water quality program are as follows:

(1) Conduct technical studies and provide guidance on water quality control.

(2) Review and provide technical assistance in programs for predicting the natural and modified water quality in impoundments, rivers, coastal areas, and estuaries for project planning, design, and regulation activities.

(3) Review and provide technical assistance on project design and reservoir regulation studies in connection with water quality control performed within the division, including multiple level outlet facilities, reservoir simulation studies, reregulation structures, and release reoxygenation systems.

(4) Provide coordination support in interagency liasion as related to water quality control through reservoir regulation, including formulation of operating plans and cooperative data collection programs.

(5) Coordinate with Planning and Construction-Operations Divisions, and the districts on SWD water quality investigation programs.

(6) In coordination with the Geotechnical and Materials Branch, manage the water quality investigation activities of the division laboratory.

(7) Responsible for technical engineering solutions to water quality problems in existing projects; reviewing, coordinating, and acting as consultants to other engineering and planning elements in the division office and district offices.

(8) Coordination of division actions required by ER 1130-2-334 for reporting of water quality management of Corps projects.

b. **Organization.**

(1) **Division.** Water quality activities in SWD are coordinated by the Water Management Branch. These duties require the part-time efforts of three engineers. One of these, Mr. Charles Sullivan, Chief, RCC, is a member of the OCE Committee on Water Quality.

(2) **Districts.** Presently the organizations for water quality management vary within the districts. In all of the districts, water quality associated with planning and design of the projects is coordinated by organizational elements within the Engineering or Planning Divisions. In two of the districts the monitoring and reporting specifically required by ER 1130-2-334 and that required for dredging and other construction are done by the Construction and Operations Divisions.

(3) **Laboratory.** The division laboratory is fully staffed and equipped to conduct the tests of water usually required by the districts for use in planning, design, construction, and operation of the projects.

c. Special Activities in FY 84.

(1) Specific Project Problems. Water quality related problems and activities at individual projects are discussed in the district reports.

(2) Water Quality Management Reports. Water quality management reports were completed for two additional projects in FY 84. Those projects are Whitney and Bardwell. Water quality Management reports are now available on 12 SWD projects.

(3) Base Line Data. Base line data acquisition was initiated at five additional SWD reservoir projects in FY 84. As of the end of the year base line data has been obtained at over 40 reservoirs. Our goal in this program is to develop a water quality data base for all SWD reservoir projects.

(4) Table Rock Dissolved Oxygen. Little Rock District completed the initial draft report entitled Table Rock Dam and Lake Dissolved Oxygen Study. The study will be completed in FY 85.

(5) Cooper Lake Studies. A heat budget analysis of the proposed Cooper Lake was initiated. Completion is scheduled for early FY 85.

(6) Addicks and Barker. The initial draft on the effect of length of impoundment on water quality in Addicks and Barker reservoirs was completed in FY 84. Final report is scheduled for FY 85.

d. Long-Term Goals. The following are presently considered as long-term continuous goals of this division, and consequently the Water Management Branch, in the water quality field.

(1) To obtain sufficient water quality information from all of our projects to determine whether all state standards and environmental objectives can be met without adverse impact on authorized uses.

(2) To promote the organization of effective water quality elements in the division and districts to obtain the maximum coordination for handling all water quality matters in the division.

(3) Provide helpful and thorough guidance to the districts on water quality matters.

e. Immediate Goals. The following actions have been scheduled for accomplishment in the near future:

(1) Continue the present intensive monitoring program for SWD reservoirs. This ongoing program will be continued until base line data are available for all SWD reservoirs.

(2) Review the basic water quality monitoring program this year.

3. **SWD Sediment Program and Activities.** Sediment activities for the year included field surveys for six reservoir resurveys, resurvey of 158 sediment ranges along the McClellan-Kerr Arkansas River Navigation Project and initiation of the original sedimentation and degredation range survey for Skiatook Lake. Reservoir Sediment Data Summaries (Form 1778's) of the results of resurveys for Eufaula and Heyburn Lakes were approved. Six reservoir sediment resurveys are scheduled for FY 85 but funding has been approved for only four of the projects. Reconnaissance surveys were conducted at several other SWD projects.

4. **DATA COLLECTION AND MANAGEMENT.**

a. **Stream Gaging Program.** Much of the data required for regulation, investigation and design of water resources projects result from the reporting and measurement of flow, water quality, and sediment. Most of these data are obtained through a Cooperative Stream Gaging Program between the Corps and the USGS. During FY 1984 the SWD-USGS cooperative program remained at 507 stations. An additional 69 stations were operated independently by the district Corps offices. In FY 84, the total cost of the SWD program was $2.1 million with $1.8 million being transferred to the USGS. The following tabulation shows a breakdown of the program by class of funds used to finance the program.

Class of Funds	Number of Stations	C of E Cost ($1,000)
Survey Investigation	11	44
General Coverage	42	38
Planning	0	0
Operation & Maintenance	434	1,890
New Work & Construction	20	120
Total:	**507***	**2,092**

NOTE: *Some stations may be counted under more than one classification.

b. **Cooperative Reporting Networks.** The National Weather Service (NWS) and the Corps of Engineers began their 47th year of cooperation in establishing and operating networks of river and/or rainfall reporting stations. Reports from these stations supplement those stations that are maintained by the NWS which are made available to the Corps of Engineers for flood control operations and flood forecasting. Data from these networks are transmitted to the Corps of Engineers district and division offices via telephone and computer interface from the NWS collection office. The two NWS RAWARC teletype drops were discontinued at the end of this year. This service has been replaced by a direct interface between the NWS S/140 computer and the WCDS Harris computer. This interface carries radar, hydrological reports, and other data essential to our water control management functions. These data include detailed precipation reports, river stage information, warnings and descriptions of severe storms and floods, and river forecasts developed by the NWS. SWDO also maintains a weather FAX machine which receives satellite pictures, radar plots, 24-hour rainfall maps and other weather maps.

The estimated FY 1984 cost for SWD responsibilities in supporting 575 rainfall stations in the Cooperative Reporting Networks was $186,148.

c. Current Monitoring System. In June 1982 the RCC began using the Water Control Data System (Harris Computer) located in the Southwestern Division office, for computations that are necessary in the RCC's daily water control activities. Harris minicomputers have been installed in the SWDO, Tulsa District, Fort Worth District, and Little Rock District offices as a part of the Water Control Data System. The Albuquerque and Galveston districts operate remotely from the SWDO computer. The following paragraphs describe continued efforts in developing the total system.

d. Water Control Data System.

(1) The "Water Control Data System Master Plan" for SWD, dated April 1979 was approved by the Office, Chief of Engineers in June 1979 for funding and detailed design. The major components of the system are:

(a) Remote Gaging Stations. The plan includes about 100 lake gages and 300 river gages that are to be equipped with data collection platforms (DCP) by the end of FY 1985.

(b) Communication. The DCP's transmit the remote gaging station data over the Geostationary Orbiting Environmental Satellite (GOES) System. Communication between the district and division data processing units will be via the division wide data communications network. A Ground Receive Station is located at Fort Worth, Texas, for receipt of the GOES transmissions.

(c) Data Acquisition and Processing Equipment. The distributed processing system dedicated to water control activities contains minicomputers located at the division office and three of the five district offices. Two of the district offices and the division office share one computer. The hardware at each site is compatible in order to allow the use of common software and data exchange between offices. The data bases at each district office will be available to the division office. The data base uses the "TOTAL" data base system and utilizes the SHEF code for data exchange with the National Weather Service.

(d) Data Display and Distribution. Data is displayed in individual offices with monocrome and color graphic CRT's, plotters, and printers. Provisions are being made to exchange data with other water management cooperators. Examples of cooperative data exchange requirements are the Office of Chief Engineers, Lower Mississippi Valley Division (LMVD), National Weather Service, Southwestern Power Administration (SWPA), state and local river authorities or agencies.

(2) A Ground Receive Station (GRS) for the SWD system was installed at the Federal Center in Fort Worth, Texas, in September 1983. This is a Synergetics Model 10C direct Readout Ground Receive Station equipped with 2 antennas (one for GOES east and one for GOES west). Both dial-up and direct line access will be provided between the GRS and the WCDS computers.

(3) A Water Control Data System Steering Committee was formed in July 1983 for the purpose of guiding the development of the WCDS software. The steering Committee has the responsibility for approving plans and schedules, monitoring progress,

assigning responsibilities to group leaders, and coordinating with OCE and other districts. The Steering Committee is chaired by the Chief of The SWD Water Management Branch, with members consisting of chiefs of district hyraulics branches and the three group chairmen functioning under the Steering Committee. These three groups are the System Software group, chaired by the Chief of the SWD Automatic Data Processing Center (ADP); the applications Software Group chaired by the Chief of the SWD Hydrologic Engineering Section; and the Users Group, chaired by the Chief of the SWD Reservoir Control Center. Each of these groups contain members from District elements. Figure 1 shows the responsibilities of each group.

(4) SWD participated in a Random Reporting (R/R) test conducted by the National Earth Satellite Service (NESS), the Corps of Engineers, and Bureau of Reclamation for the purpose of obtaining factual information concerning this type of data collection reporting. The major goals of the test are to determine (a) reliability; (b) manageability; (c) ability to operate within NESS guidelines for R/R; (d) efficient use of NESS resources; and (e) type of R/R operation NESS will support within its system. This test was completed in FY 84. The test results are contained in a report prepared by NESS.

(5) At the end of FY 84, there were 333 DCP's installed, 43 on hand for installation and 14 on order. There are also 46 gages equipped with DARDC's.

e. Cooperative Data Bank and Forecasting Activity. During the past year, RCC has continued to participate in and encourage the advancement of programs for automated data collection and interagency cooperation in forecasting activity and data bank utilization. Currently, SWD maintains a data bank on the Water Control Data System computer for Daily Lake Reports, Daily Power Generation Reports, and Daily River Reports. These data banks are updated daily and the data are maintained until the end of the month then used for monthly summaries. These data, with several district auxiliary programs and data bases, have been used to make forecasts and reports available for exchange as needed between the districts and SWDO. In addition, the data are made available to other users which have a need to be aware of the water control activities on a real-time basis. These users include SWPA, NWS, LMVD, and OCE. SWD has also participated in a program to develop a data base (DATSYS) for water control information for the Mississippi River Basin. SWD districts have participated in storing data in the EPA STORET and USGS WATSTORE data banks. Both of these systems have also been used for retrieving data. The Little Rock District has placed sediment data in the WATSTORE data system.

5. COORDINATION WITH WATER MANAGEMENT INTERESTS.

a. General. The benefits deriving from personal contact with other persons associated with water management activities are well recognized by the RCC. For this reason, special emphasis has been placed on maintaining this personal contact through meetings and workshops sponsored by the districts and the RCC with the marketing agency, project personnel, river basin authorities, other RCC's, the Chief's office and others.

(1) The Hydrologic Engineering Section and the Hydraulics Section (other sections in the Water Management Branch) furnish support to the RCC. The Hydrologic

Engineering Section conducts systems studies of reservoir regulation and the Hydraulics Section reviews studies on sediment and water quality activities.

(2) A meeting of lake regulation personnel of each of the districts and the RCC is held annually at the division Reservoir Control Center for the purpose of discussing timely topics and exchanging information. Normally the Hydrologic Engineering and the Hydraulics Sections will hold joint meetings with the RCC. This year's meeting included the RCC and The Hydrologic Engineering Section. The minutes of the 14 and 15 November 1984 meetings are included in Section VIII.

b. Agency Coordination.

(1) Trinity River Basin Water Management Interests Group. In order to provide a means for exchanging ideas and coordinating the interests of local, State and Federal agencies and private companies in the regulation and development of water resources of the Trinity River Basin, the RCC has initiated and sponsored meetings of the Trinity River Water Basin Management Interests Group. A meeting was held during October 1984.

The Fourteenth annual meeting of this group was held on 23 October 1984. Attendance included 30 persons representing the State of Texas, several municipalities, water districts, companies, and agencies of the Federal Government. An agenda, minutes of the meeting and a list of attendees are included in Section VIII of this report.

(2) Cooperation with Lower Mississippi Valley Division. The SWD RCC continues its cooperation with LMVD and provides observed, as well as forecasted data significant to the water management activities in LMVD. Exchange of data within the Mississippi River Basin has been improved by the development of a Data Management System by HEC on the OCE computer for critical river stations within the basin. Both forecasted and current data can be retrieved for individual division and district use.

(3) Cooperation with Federal Energy Regulatory Commission. Periodic formal and informal contact through meetings sponsored by the RCC keeps Corps and FERC staff members informed on trends and problems associated with production of hydroelectric power. The RCC also coordinates activities on FERC license applications for nonfederal hydropowder development at SWD Corps project.

(4) Cooperation with Southwestern Power Adminisration. The SWPA is an agency of the United States, established in the Department of the Energy, to execute the purposes of the Flood Control Act of 1944 with respect to the disposition of the electric power and energy made available from the reservoir projects under control of the Department of the Army in the area comprising all of Arkansas and Louisiana and portions of Missouri, Kansas, Texas and Oklahoma. The scheduling of release for hydroelectric power production from the 17 Corps of Engineers projects within SWD has a significant effect on the overall water management activities in the division. Therefore, close cooperation and continuous communication between the Corps and SWPA are mandatory. A Memorandum of Understanding was signed by the SWPA and the Corps of Engineers in 1980. SWPA and SWD are in the process of finializing a detail operating arrangement to assist in the operations of hydropower projects within SWD. Specific activities included in the operating arrangement for cooperation between SWPA and RCC, are monthly

scheduling of power production, preparation of data for reports to the Federal Energy Regulatory Commission (FERC), and daily coordination of routine data on current conditions, inflow forecasts, and release schedules. The RCC has taken every opportunity to improve and strengthen relations with SWPA through correspondence, regularly scheduled and special meetings, providing access to our time-share systems, and by special studies aimed at improving energy production and scheduling at SWD power projects.

(5) **National Weather Service.** Future workshops will be needed for establishing criteria and implementation procedures for comprehensive interagency data banks. The automated data collection and handling equipment being acquired by the Corps and NWS will require extensive coordinating efforts over the next few years. During the past year several meetings between the Corps and NWS were held to establish procedures for computer to computer exchange of hydrometerological data.

STEERING COMMITTEE - Terry Coomes

- assigns responsibility
- approve schedules
- monitors progress
- resolves turf battles
- coordinates with OCE and other divisions

SYSTEM SOFTWARE
John Turner - SWDAD

1. Evaluates, purchases and maintains all hardware (except field equip.)
2. Obtains, implements and maintains software for acquisition group,* data base and system aspects of data base utility group*
3. Supports application groups.
4. Prepares schedules and implementation plans.
5. Assigns tasks to districts, contractors, labs, etc, monitors progress and reviews final products.

APPLICATIONS SOFTWARE
Ron Hula - SWDED-H

1. Obtains, implements and maintains software for analysis group* and applications aspects of data base utility group.*
2. Evaluates existing applications software and implements and/or modifies to meet user requirements.
3. Reviews documentation of software and accepts or requires revision as necessary.
4. Maintains inventory of available software and documentation.
5. Implements acceptable software for use SWD wide.
6. Arranges for training in applications as necessary.
7. Coordinates development and use of applications software with HEC and other Corps districts and divisions.
8. Supports system software group.
9. Prepares schedules and Implementation Plans.

USERS
Charles Sullivan - SWDED-WR

1. Coordinates all funding issues for system.
2. Coordinates & implements the selection, purchase, installation and maintanence of field equipment.
3. Monitors SWD downlink performance.
4. Presents user viewpoint to applications and system software groups.
5. Coordinates with OCE and other Corps offices.
6. Develops interagency agreements for data exchange including financial arrangements.
7. Develops user priorities for software development.
8. Supports applications group in evaluating existing software.
9. Updates SWD master plan and software design manual as necessary.
10. Prepares schedules and Implementation plans.

* See SWD Software Manual

SECTION III FACILITIES AND PERSONNEL

SECTION III - FACILITIES AND PERSONNEL

1. **Facilities.**

a. **Office Space.** SWD personnel occupies quarters in the Santa Fe Building, 1114 Commerce Street, Dallas, Texas. Space occupied by the RCC includes an open-space working area, and a computer equipment room.

b. **Display Facilities.** All of the RCC display equipment used for conferences and for briefing of higher authorities is located in the Engineering Division conference room. This equipment included a triple duty wall display unit containing metal chalkboards, vinyl covered cork boards, and white metal panels adequate for grease pencil or for projection screen; various projection equipment, and a projection screen.

c. **Communications Equipment.** The computer equipment room contains two dot-matrix hard-copy TTY terminals; one letter quality terminal, a CRT which is hardwired to the Harris minicomputer, Tektronix color graphics terminal with plotter and digitizing tablet, magnetic tape storage, and a weather FAX machine. The time-share terminals are used for access of Harris, Honeywell, WRDC and CDC computer facilities. The SWD Ground Receive Station (for receipt of remote sensor information via GOES) is located at the Federal Center in Fort Worth, Texas.

2. **Personnel.**

a. **Staff.** The authorized staff of the RCC consists of one supervisory hydraulic engineer, two hydraulic engineers and one hydrologic technical (a reduction of two spaces). The RCC is supported in technical studies by the Hydrologic Engineering and the Hydraulics Sections. The current organization chart for the SWD Water Management Branch is shown in figure 2.

b. **Training.** The RCC periodically assesses the training needs of its personnel and schedules that training which is required and desirable for maintaining expertise and capability to fulfull its mission. Scheduled training for the immediate future includes various hydrologic and management courses. Additional training objectives are accomplished through active participation and leadership by RCC personnel in committees such as the Arkansas River Basin Coordinating Committee, the Red and Trinity River Basin Water Management Interests Groups, and the Corps of Engineers Committee on Water Quality.

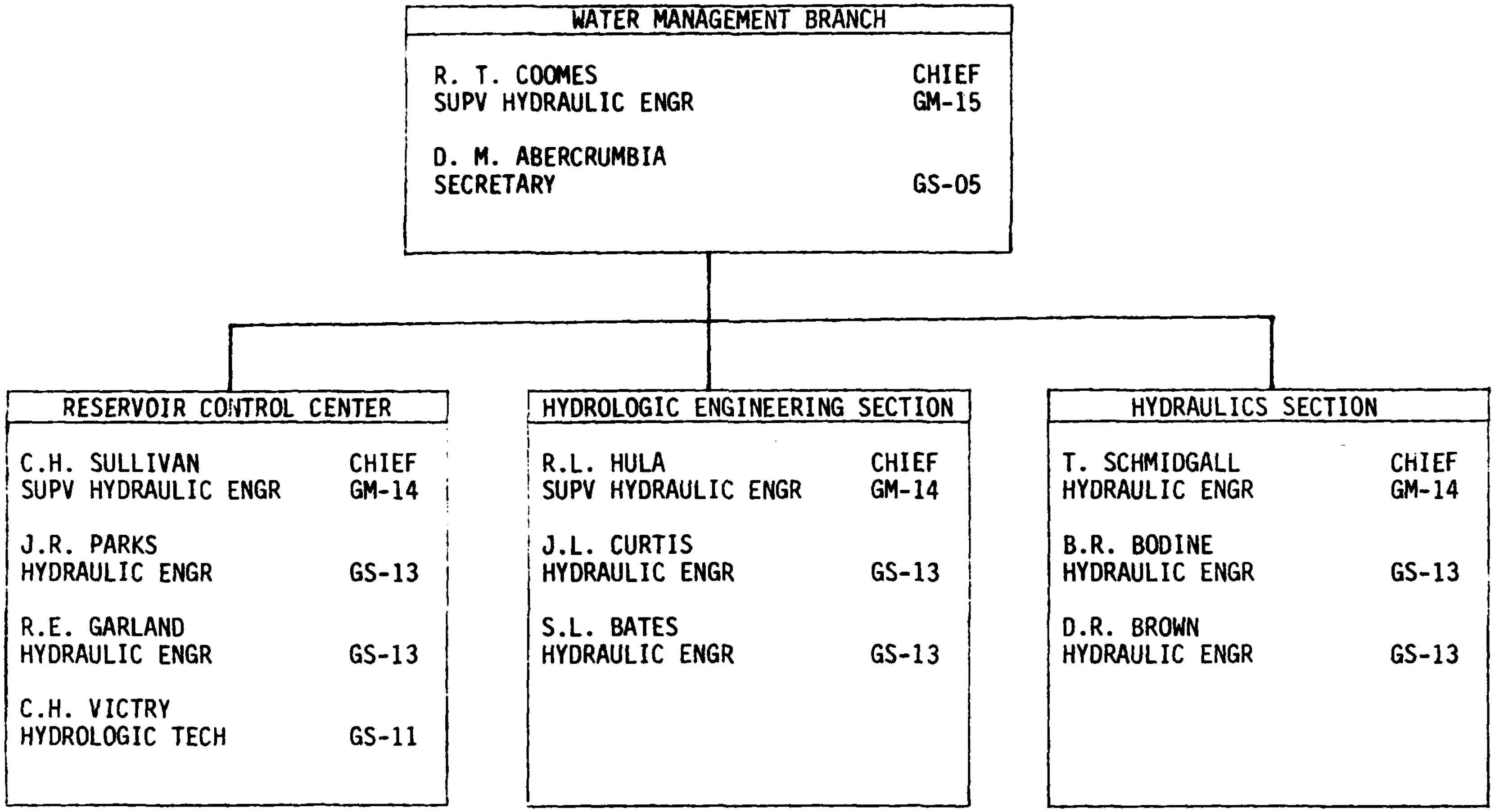

WATER MANAGEMENT BRANCH
R. T. COOMES CHIEF
SUPV HYDRAULIC ENGR GM-15
D. M. ABERCRUMBIA
SECRETARY GS-05
RESERVOIR CONTROL CENTER
C.H. SULLIVAN CHIEF
SUPV HYDRAULIC ENGR GM-14
J.R. PARKS
HYDRAULIC ENGR GS-13
R.E. GARLAND
HYDRAULIC ENGR GS-13
C.H. VICTRY
HYDROLOGIC TECH GS-11
HYDROLOGIC ENGINEERING SECTION
R.L. HULA CHIEF
SUPV HYDRAULIC ENGR GM-14
J.L. CURTIS
HYDRAULIC ENGR GS-13
S.L. BATES
HYDRAULIC ENGR GS-13
HYDRAULICS SECTION
T. SCHMIDGALL CHIEF
HYDRAULIC ENGR GM-14
B.R. BODINE
HYDRAULIC ENGR GS-13
D.R. BROWN
HYDRAULIC ENGR GS-13

Figure 2

SECTION IV - STATUS OF RESERVOIR WATER CONTROL MANUALS IN SWD

STATUS OF WATER CONTROL MANUALS IN SWD
(Report Control Symbol DAEN-CWE-16) Revised: 1 January 1985

RESERVOIR	STREAM	OWNER	DIST	WATER CONTROL MANUAL SUBMITTED	SCHEDULED THRU FY 87	APPROVED	
WHITE RIV MASTER		CE	LRD	DEC 54 F		DEC 55 OCE	
BEAVER	WHITE RIV BASIN	CE	LRD	OCT 66 F		JAN 67 OCE	
TABLE ROCK	WHITE RIV BASIN	CE	LRD	OCT 66 F		JAN 67 OCE	
BULL SHOALS	WHITE RIVER BASIN	CE	LRD	OCT 66 F		JAN 67 OCE	
NORFORK	WHITE RIVER BASIN	CE	LRD	OCT 66 F		JAN 67 OCE	
CLEARWATER	BLACK RIVER	CE	LRD	JAN 73 U	MAR 86 R	FEB 73 SWD	R*
GREERS FERRY	LITTLE RED RIVER	CE	LRD	OCT 65 F		JUN 66 OCE	
ARKANSAS MASTER		CE	AD	APR 69 F		JUN 70 OCE	
PUEBLO (1)	ARKANSAS RIVER	BR	AD	DEC 77 F		JUN 84 SWD	
TRINIDAD	PURGATORIE RIVER	CE	AD	JUL 78 F	FEB 85 U	OCT 79 SWD	
JOHN MARTIN	ARKANSAS RIVER	CE	AD	NOV 82 U		JAN 83 SWD	AR
ARKANSAS MASTER		CE	TD	APR 76 U		SEP 80 SWD	
CHENEY (1)	N.F.NINNESCAH	BR	TD	OCT 65		MAR 66 OCE	AR
EL DORADO	WALNUT RIVER	CE	TD	FEB 81 F		FE 83 SWD	
KAW	ARKANSAS RIVER	CE	TD	DEC 77 F		JAN 78 SWD	
GREAT SALT PLAINS	SALT FORK ARK	CE	TD	NOV 66 F		APR 67 OCE	
KEYSTONE	ARKANSAS RIVER	CE	TD	NOV 63 F	SEP 85 U	APR 65 OCE	
HEYBURN	POLECAT CREEK	CE	TD	JUL 84 U		DEC 84 SWD	
VERDIGRIS SYSTEM							
TORONTO	VERDIGRIS RIVER	CE	TD	JUN 66 F	MAR 86 U	AUG 66 OCE	
FALL RIVER	FALL RIVER	CE	TD	JUN 66 F	OCT 86 U	AUG 66 OCE	
ELK CITY	ELK RIVER	CE	TD	JUN 66 F	MAR 87 U	AUG 66 OCE	
PEARSON-SKUBITZ-BIG HILL	BIG HILL CREEK	CE	TD	AUG 82		SEP 82 SWD	AR
OOLOGAH	VERDIGRIS RIVER	CE	TD	DEC 75 U		JAN 76 SWD	AR
COPAN	CANEY RIVER	CE	TD	NOV 82 F		MAR 83 SWD	
HULAH	CANEY RIVER	CE	TD	OCT 68	SEP 86	JUN 69 OCE	AR
BIRCH	BIRD CREEK	CE	TD	AUG 81 F		SEP 81 SWD	
SKIATOOK	HOMINY CREEK	CE	TD	APR 84 F		DEC 84 SWD	

STATUS OF WATER CONTROL MANUALS IN SWD
(Report Control Symbol DAEN-CWE-16)   Revised: 1 January 1985

RESERVOIR	STREAM	OWNER	DIST	SUBMITTED	WATER CONTROL MANUAL SCHEDULED THRU FY 87	APPROVED	
UPPER GRAND SYS							
COUNCIL GROVE	NEOSHO RIVER	CE	TD	APR 74 F		MAY 74 SWD	
MARION	COTTONWOOD RIVER	CE	TD	JUL 74 F		AUG 74 SWD	
JOHN REDMOND	NEOSHO RIVER	CE	TD	SEP 76 R			
PENSACOLA (1)	NEOSHO RIVER	GRDA	TD	SEP 64	JUL 86 R	MAR 65 OCE	AR
MARKHAM FERRY (1)	NEOSHO RIVER	GRDA	TD	SEP 64	DEC 86 R	MAR 65 OCE	AR
FORT GIBSON	NEOSHO RIVER	CE	TD	SEP 64	JUL 87 R	MAR 65 OCE	AR
TENKILLER FERRY	ILLINOIS RIVER	CE	TD	JUL 76 F		MAR 77 SWD	
CONCHAS	CANADIAN RIVER	CE	AD	JUN 67 F		JAN 68 OCE	
SANFORD (1)	CANADIAN RIVER	BR	TD	SEP 65	SEP 85 U	FEB 66 OCE	AR
NORMAN (1)	LITTLE RIVER	BR	TD	FEB 65 F		NOV 65 OCE	
OPTIMA	N. CANADIAN RIVER	CE	TD	DEC 69		FEB 70 SWD	AR
FORT SUPPLY	WOLF CREEK	CE	TD	DEC 69		FEB 70 SWD	AR
CANTON	N. CANADIAN RIVER	CE	TD	DEC 69		FEB 70 SWD	AR
ARCADIA	DEEP FORK RIVER	CE	TD		OCT 85		
EUFAULA	CANADIAN RIVER	CE	TD	SEP 62 F		NOV 63 OCE	
NEWT GRAHAM PT VI, L&D 18	ARKANSAS RIVER	CE	TD	APR 72 F		JUN 72 SWD	
CHOUTEAU PT V, L&D 17	ARKANSAS RIVER	CE	TD	APR 72 F		JUN 72 SWD	
WEBBERS FALLS PT IV,L&D 16	ARKANSAS RIVER	CE	TD	JUL 72 F		JUL 72 SWD	
R.S. KERR PT III, L&D 15	ARKANSAS RIVER	CE	TD	APR 72 F		APR 72 SWD	
W.D. MAYO PT II, L&D 14	ARKANSAS RIVER	CE	TD	OCT 72		JAN 73 SWD	AR
WISTER	POTEAU RIVER	CE	TD	MAR 74 F		JUN 74 SWD	
BLUE MOUNTAIN	PETIT JEAN	CE	LRD	FEB 68 F	SEP 87 U	MAR 68 OCE	
NIMROD	FOURCHE LA FAVE	CE	LRD	SEP 67 F		MAR 68 OCE	
LOCK & DAM 13	ARKANSAS RIVER	CE	LRD	SEP 74 F		SEP 74 SWD	
OZARK-JETA TAYLOR	ARKANSAS RIVER	CE	LRD	SEP 74 F		SEP 74 SWD	
DARDANELLE	ARKANSAS RIVER	CE	LRD	MAR 76 F		APR 76 SWD	
LOCK & DAM 9	ARKANSAS RIVER	CE	LRD	MAR 76 F		APR 76 SWD	

STATUS OF WATER CONTROL MANUALS IN SWD
(Report Control Symbol DAEN-CWE-16) Revised: 1 January 1985

RESERVOIR	STREAM	OWNER	DIST	WATER CONTROL MANUAL SUBMITTED	SCHEDULED THRU FY 87	APPROVED	
LOCK & DAM 8 TOAD SUCK FERRY	ARKANSAS RIVER	CE	LRD	JUL 74 F		SEP 74 SWD	
LOCK & DAM 7 MURRAY	ARKANSAS RIVER	CE	LRD	JUL 74 F		SEP 74 SWD	
LOCK & DAM 6 DAVID D. TERRY	ARKANSAS RIVER	CE	LRD	OCT 71 F		SEP 74 SWD	
LOCK & DAM 5	ARKANSAS RIVER	CE	LRD	OCT 71 F		SEP 74 SWD	
LOCK & DAM 4	ARKANSAS RIVER	CE	LRD	OCT 71 F		SEP 74 SWD	
LOCK & DAM 3	ARKANSAS RIVER	CE	LRD	OCT 71 F		SEP 74 SWD	
LOCK & DAM 2 (ARK POST CANAL)	ARKANSAS RIVER	CE	LRD	OCT 71 F		SEP 74 SWD	
<u>RED RIVER MASTER</u>		CE	TD	NOV 62		FEB 63 OCE	AR
ALTUS (1)	N. FORK RED	BR	TD	DEC 67 F	SEP 86 R	OCT 68 OCE	
MOUNTAIN PARK (1)	OTTER CREEK	BR	TD	JAN 76	JUN 86 R	MAR 76 SWD	R*
TRUSCOTT BRINE LAKE	BLUFF CREEK	CE	TD		AUG 85		
LAKE KEMP (1)	WICHITA RIVER	WCID	TD	MAY 73 F		JUN 73 SWD	
WAURIKA	BEAVER CREEK	CE	TD	APR 77 F		APR 77 SWD	
FOSS (1)	WASHITA RIVER	BR	TD	FEB 61 F	SEP 87 U	MAY 61 OCE	
FORT COBB (1)	COBB CREEK	BR	TD	JAN 60 F	JUN 87 U	MAR 61 OCE	
ARBUCKLE (1)	ROCK CREEK	BR	TD	NOV 66		SEP 67 OCE	AR
TEXOMA	RED RIVER	CE	TD	JUN 75 F		APR 84 SWD	
PAT MAYSE	SANDERS CREEK	CE	TD	DEC 66 F		OCT 67 OCE	
SARDIS	JACKFORK CREEK	CE	TD	JAN 84 F			
MCGEE CREEK (1)	MUDDY BOGGY CREEK	BR	TD		SEP 85	AUG 84 SWD	
HUGO	KIAMICHI RIVER	CE	TD	MAY 82		JUL 82 SWD	AR
LITTLE RIV SYS							
PINE CREEK	LITTLE RIVER	CE	TD	MAY 74		JUL 74 SWD	AR
BROKEN BOW	MOUNTAIN FORK	CE	TD	JUL 74 F		NOV 74 SWD	
DEQUEEN	ROLLING FORK	CE	LRD	MAY 76 F		JUN 76 SWD	R
GILLHAM	COSSATOT RIVER	CE	LRD	MAR 67	NOV 85 R	APR 81 SWD	R*
DIERKS	SALINE RIVER	CE	LRD	JUN 75 F		APR 76 SWD	
MILLWOOD	LITTLE RIVER	CE	TD	SEP 73 F		NOV 73 SWD	

STATUS OF WATER CONTROL MANUALS IN SWD
(Report Control Symbol DAEN-CWE-16)   Revised: 1 January 1985

RESERVOIR	STREAM	OWNER	DIST	WATER CONTROL MANUAL SUBMITTED	SCHEDULED THUR FY 87	APPROVED	
<u>SULPHUR RIV MASTER</u>							
COOPER	SULPHUR RIVER	CE	FWD				
WRIGHT PATMAN	SULPHUR RIVER	CE	FWD	SEP 74 U		NOV 74 LMVD	
LAKE O' THE PINES	CYPRESS CREEK	CE	FWD	JUN 74 U		NOV 74 LMVD	
<u>NECHES RIV MASTER</u>		CE	FWD	MAY 62		MAR 63 OCE	AR
B. A. STEINHAGEN	NECHES RIVER	CE	FWD	JUL 51	ARP 86	FEB 63 OCE	AR
SAM RAYBURN	ANGELINA RIVER	CE	FWD	JAN 73 R	APR 86	FEB 73 SWD	AR
<u>TRINITY RIV MASTER</u>		CE	FWD	MAY 75 P	MAY 86	MAY 75 SWD	
BENBROOK	CLEAR FORK	CE	FWD	MAY 75 P	MAY 86	MAY 86 SWD	
JOE POOL	MOUNTAIN CREEK	CE	FWD		NOV 84 P		
RAY ROBERTS	ELM FORK	CE	FWD		MAR 85 P		
LEWISVILLE	ELM FORK	CE	FWD	MAY 75 P	MAY 87	MAY 75 SWD	
GRAPEVINE	DENTON CREEK	CE	FWD	MAY 75 P		MAY 75 SWD	
LAVON	EAST FORK	CE	FWD	MAY 75 P		MAY 75 SWD	
NAVARRO MILLS	RICHLAND CREEK	CE	FWD	MAY 63		JUL 64 OCE	AR
BARDWELL	WAXAHACIE CREEK	CE	FWD	AUG 63		JUL 65 OCE	AR
WALLISVILLE	TRINITY RIVER	CE	GD				
<u>BUFFALO BAYOU MASTER</u>		CE	GD				
BARKER	BUFFALO BAYOU	CE	GD	MAY 63 F		OCT 72 SWD	R
ADDICKS	BUFFALO BAYOU	CE	GD	MAY 63 F		OCT 72 SWD	R
<u>BRAZOS RIV MASTER</u>		CE	FWD	JAN 73		MAR 73 SWD	R*
WHITNEY	BRAZOS RIVER	CE	FWD	JAN 74 F		APR 75 SWD	
AQUILLA	AQUILLA CREEK	CE	FWD	AUG 83 P	SEP 85	MAY 84 SWD	AR
PROCTOR	LEON RIVER	CE	FWD	FEB 74 F		APR 74 SWD	
BELTON	LEON RIVER	CE	FWD	APR 76 F		MAY 76 SWD	
STILLHOUSE HOLLOW	LAMPASAS RIVER	CE	FWD	MAY 76 F		JUL 76 SWD	
GEORGETOWN	N.F.SAN GABRIEL	CE	FWD	DEC 79 P	JUL 86	JUN 80 SWD	R
GRANGER	SAN GABRIEL	CE	FWD	OCT 82		NOV 82 SWD	R

STATUS OF WATER CONTROL MANUALS IN SWD
(Report Control Symbol DAEN-CWE-16) Revised: 1 January 1985

RESERVOIR	STREAM	OWNER	DIST	WATER CONTROL MANUAL SUBMITTED	SCHEDULED THRU FY 87	APPROVED	
WACO	BOSQUE RIVER	CE	FWD	JUL 73 F		AUG 73 SWD	
SOMERVILLE	YEGUA CREEK	CE	FWD	OCT 73 F		NOV 73 SWD	
COLORADO RIV MASTER		CE	FWD				
HORDS CREEK	HORDS CREEK	CE	FWD	SEP 55		MAY 62 OCE	AR
O.C. FISHER	N. CONCHO	CE	FWD	JAN 56		DEC 62 OCE	AR
TWIN BUTTES (1)	S. CONCHO	BR	FWD	JAN 66 P	DEC 86	SEP 66 FR	
MARSHALL FORD (1)	COLORADO RIVER	BR	FWD	DEC 79	DEC 86	MAY 80 SWD	R/FR
GUADALUPE RIV MASTER		CE	FWD	OCT 63		JAN 66 OCE	AR
CANYON	GUADALUPE RIVER	CE	FWD	MAR 73 F		MAY 73 SWD	
RIO GRANDE MASTER		CE	AD	AUG 66 F		FEB 67 OCE	
ABIQUIU	RIO CHAMA	CE	AD	APR 82 U	SEP 87 R	JUN 82 SWD	
COCHITI	RIO GRANDE	CE	AD	AUG 78 F	SEP 85 U	JUN 81 SWD	
GALISTEO	GALISTEO CREEK	CE	AD	MAR 68 F		APR 68 OCE	
JEMEZ CANYON	JEMEZ RIVER	CE	AD	AUG 66 F		AUG 84 SWD	R#
PLATORO (1)	CONEJOS RIVER	BR	AD	APR 64 F		MAY 64 OCE	
PECOS RIV MASTER		CE	AD	NOV 77		NOV 77 SWD	AR
SANTA ROSA	PECOS RIVER	CE	AD	DEC 79 F	SEP 86 U	SEP 81 SWD	
SUMNER (1)	PECOS RIVER	BR	AD	MAR 82	DEC 85 R	JUL 84 SWD	AR
TWO RIVERS	RIO HONDO	CE	AD	JUN 62 F		JUN 64 OCE	

NOTES:

(1) = Section 7 project, flood control regulation by CE.
AR = Approved, comments to be answered.
F = Complete, comments have been answered and approved.
FR = Published in Federal Register.
P = Plan.
R = Revision or answer to comments.
R# = Returned without approval.
U = Update of existing approved manual.
GRDA = Grand River Dam Authority.
WCID = Wichita County Water Improvement District.
LCRA = Lower Colorado River Authority.
BR = Bureau of Reclamation.

SECTION V - REGULATION OF MULTI-PURPOSE PROJECTS WITH HYDROPOWER

SECTION V
HYDROPOWER GENERATION
AT
SOUTHWESTERN DIVISION PROJECTS

The 17 hydropower projects are listed in table 1. Generation by project for the last five fiscal years is shown in table 2. Also, generation by the projects, since impoundment, is shown on following graphs.

TABLE 1

Projects	Basin	Stream	No. Units.	Total Capacity MW	Plate No.
Beaver	White	White	2	112	1
Table Rock	White	White	4	200	2
Bull Shoals	White	White	8	340	3
Norfork	White	North Fork	2	70	4
Greers Ferry	White	Little Red	2	96	5
Keystone	Arkansas	Arkansas	2	70	6
Ft. Gibson	Arkansas	Grand	4	45	7
Webbers Falls	Arkansas	Arkansas	3	60	8
Tenkiller Ferry	Arkansas	Illinois	2	34	9
Eufaula	Arkansas	S. Canadian	3	90	10
R.S. Kerr	Arkansas	Arkansas	4	110	11
Ozark-Jeta Taylor	Arkansas	Arkansas	5	100	12
Dardanelle	Arkansas	Arkansas	4	124	13
Denison	Red	Red	2	70	14
Broken Bow	Red	Mountain Fork	2	100	15
Sam Rayburn	Neches	Angelina	2	52	16
Whitney	Brazos	Brazos	2	30	17

TABLE 2
Fiscal Year
(in 1,000 GWH)

	1980	1981	1982	1983	1984
Beaver	58.4	63.0	130.6	173.2	116.3
Table Rock	312.0	93.3	384.0	680.2	471.2
Bull Shoals	466.9	185.1	400.9	1084.8	697.1
Norfork	166.5	56.1	116.9	260.9	209.7
Greers Ferry	135.9	61.3	134.1	344.8	158.3
Keystone	296.5	80.1	277.0	231.2	234.4
Ft. Gibson	155.8	71.5	239.9	216.2	203.6
Webbers Falls	186.4	0	0	91.9	190.3
Tenkiller Ferry	48.0	36.7	109.7	94.8	78.3
Eufaula	137.9	47.8	354.0	239.5	195.1
R. S. Kerr	482.3	170.2	613.8	577.9	526.5
Ozark-Jeta Taylor	320.2	65.0	0	134.7	193.2
Dardanelle	588.5	283.8	705.0	656.9	595.8
Denison	123.3	148.5	303.6	188.6	198.9
Broken Bow	122.1	132.3	163.0	194.7	139.5
Sam Rayburn	147.9	39.4	57.1	174.6	125.3
Whitney	23.8	49.7	104.2	28.5	15.0

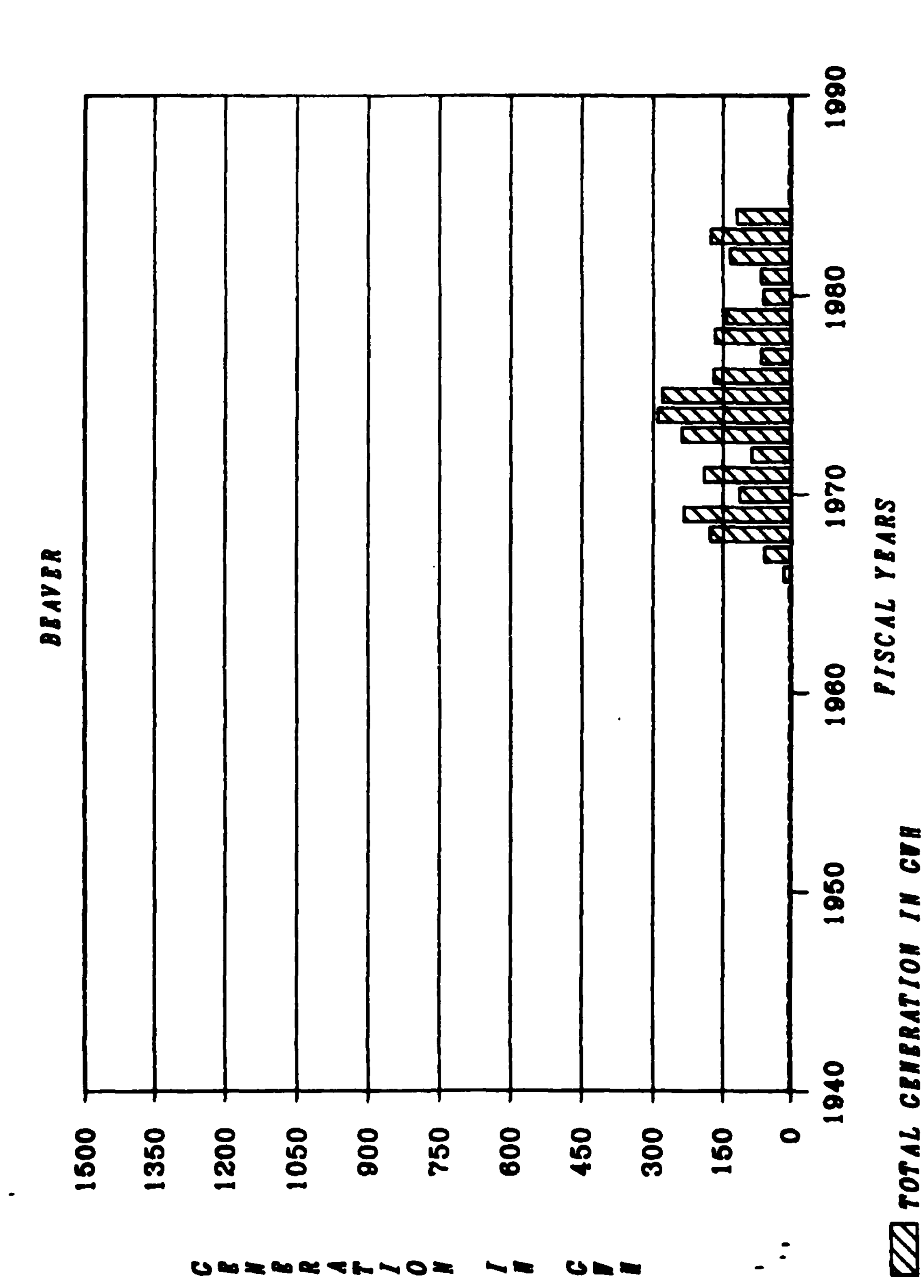

BEAVER
GENERATION IN GWH
1500
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 1

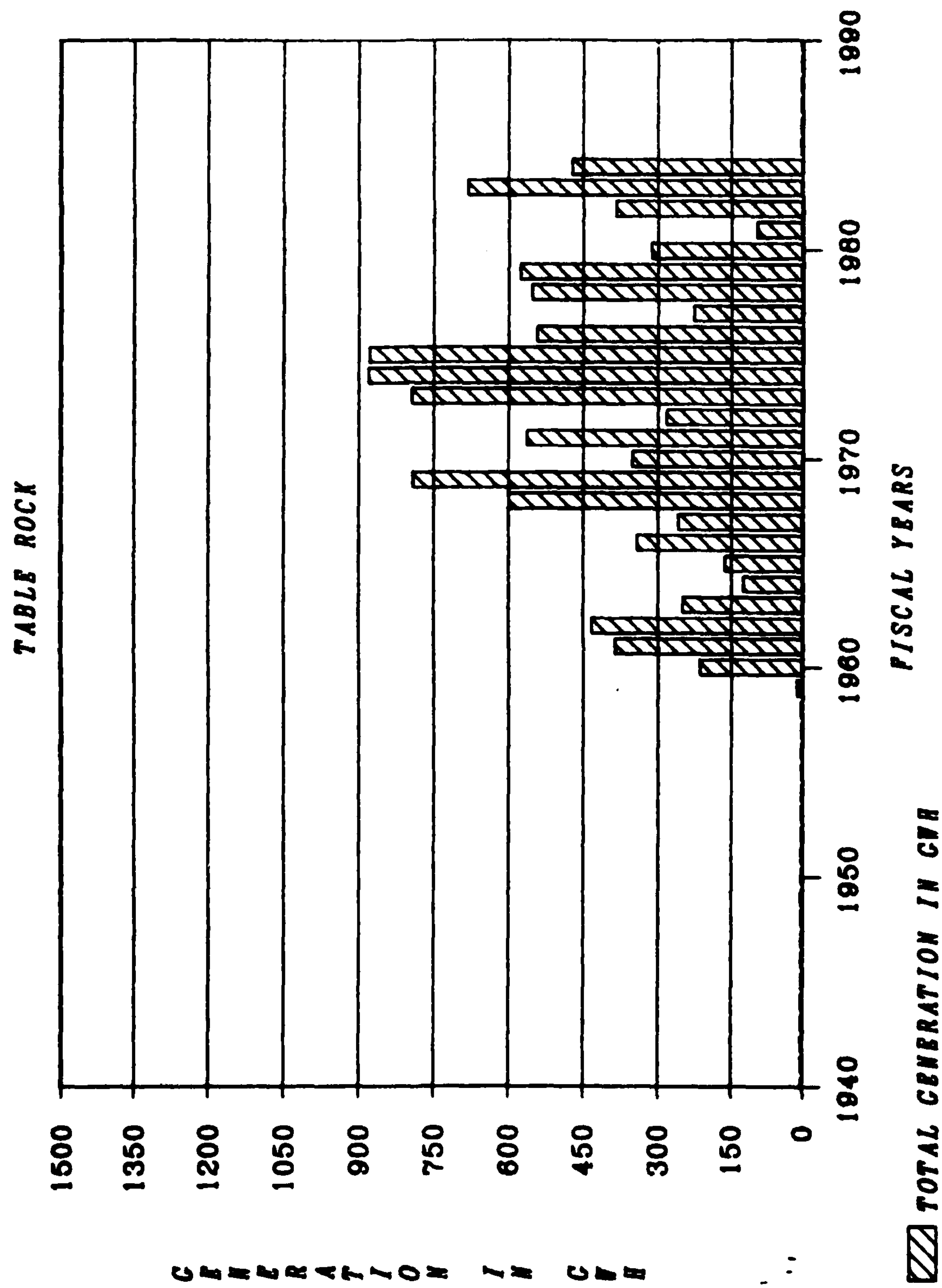
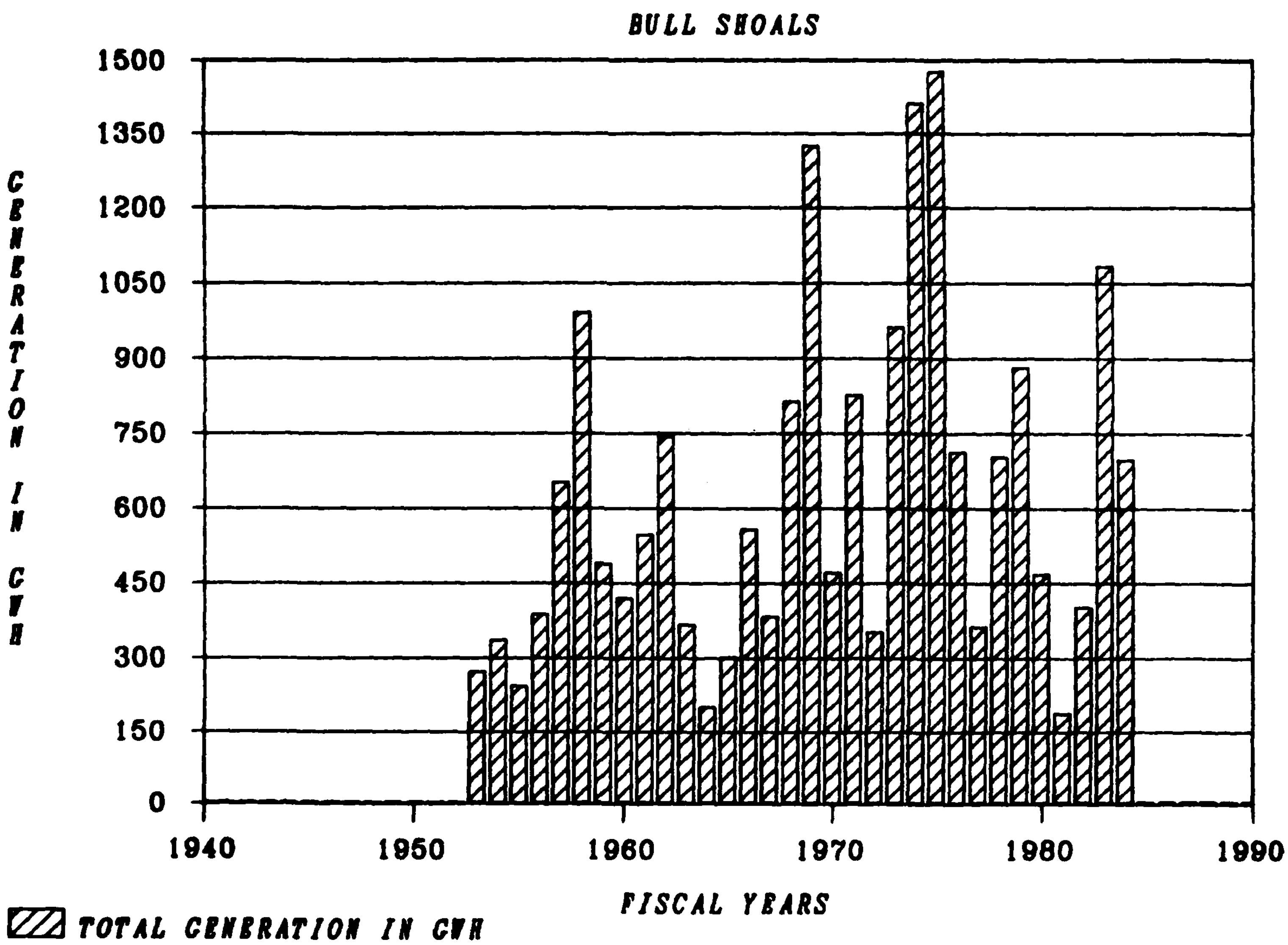
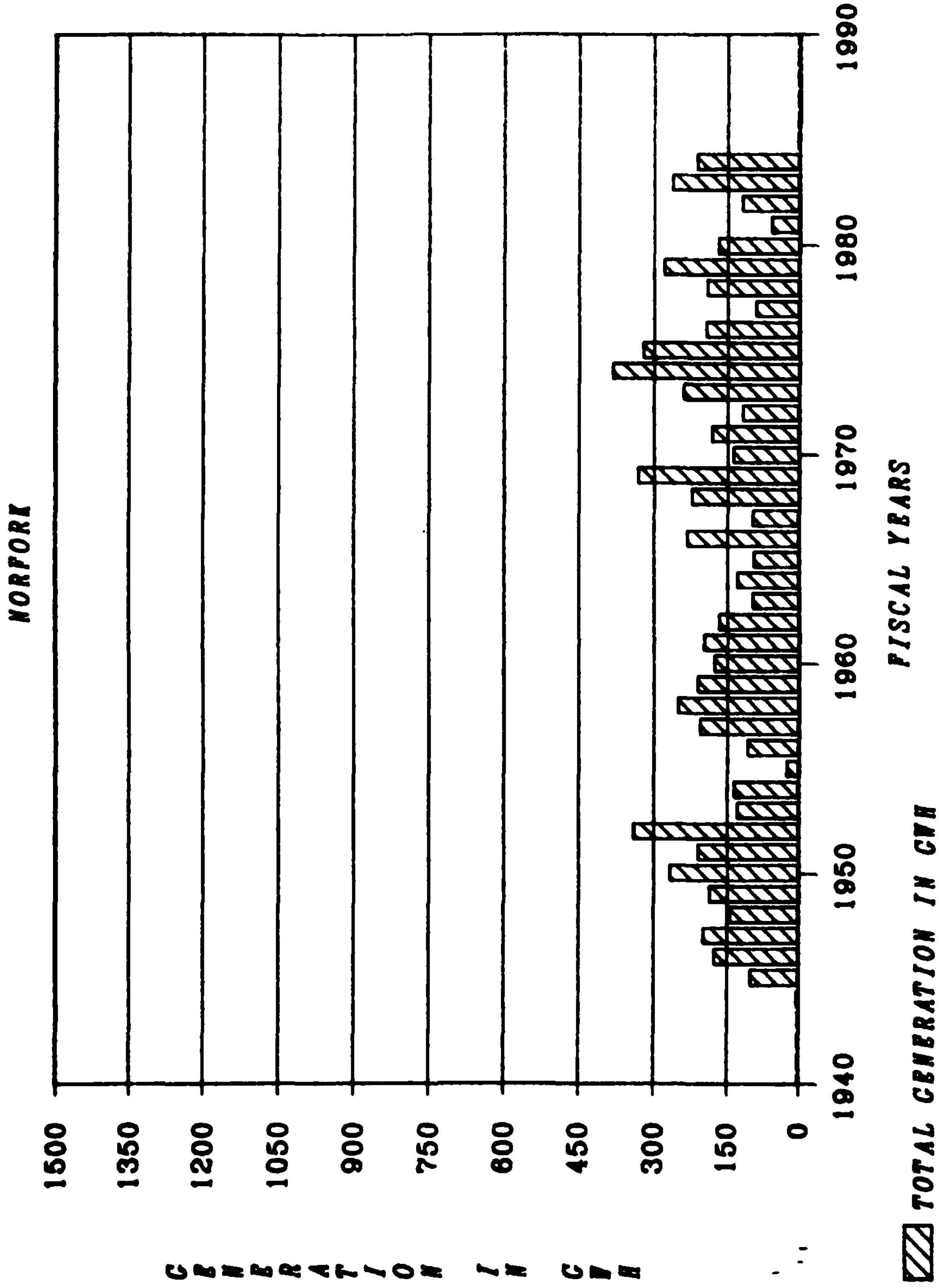


TABLE ROCK
GENERATION IN GWH
1500
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 2


BULL SHOALS
GENERATION IN GWH
1500
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH



NORFORK
GENERATION IN GWH
1500
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 4

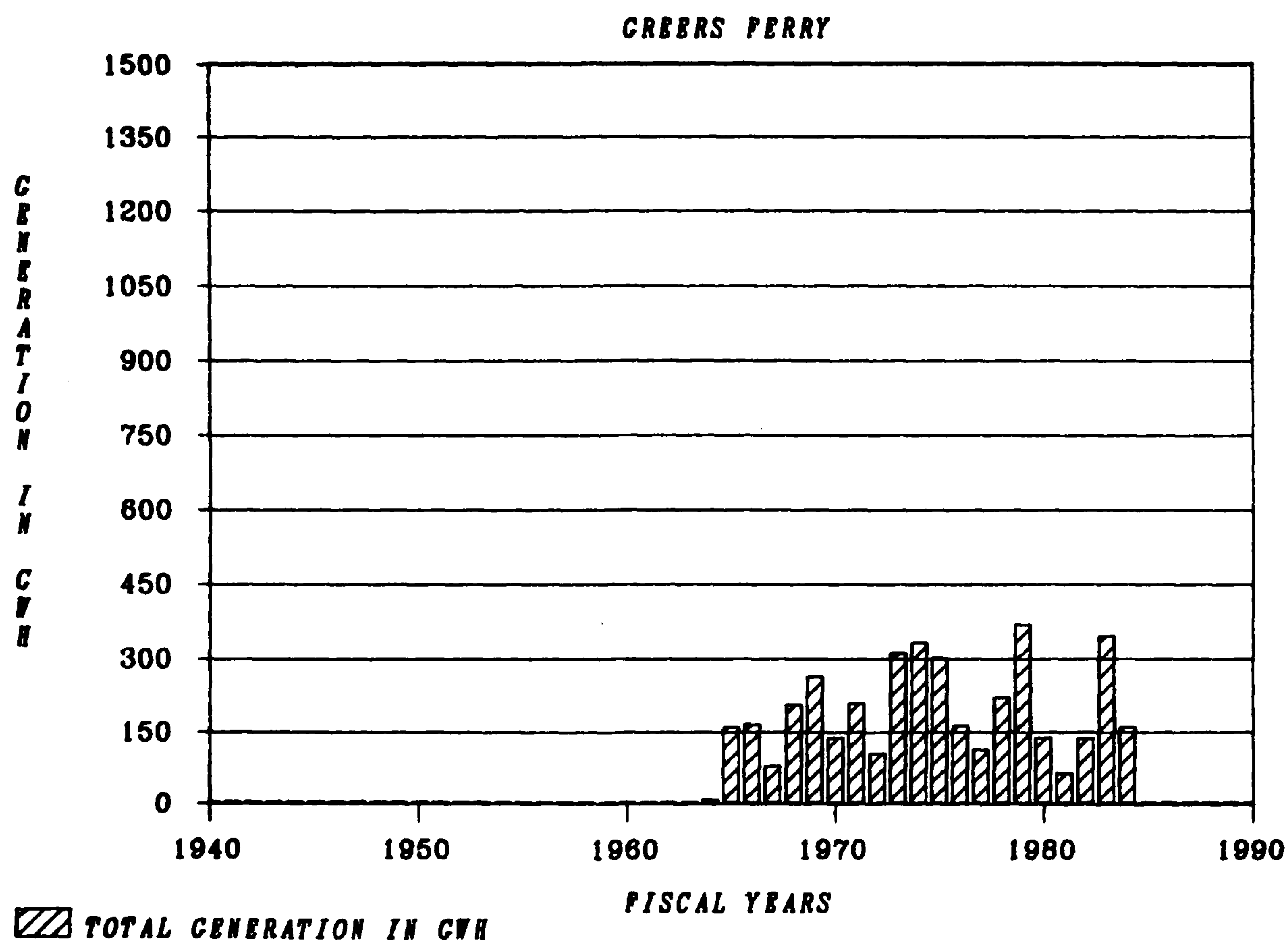

GREERS FERRY
GENERATION IN GWH
1500
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 5

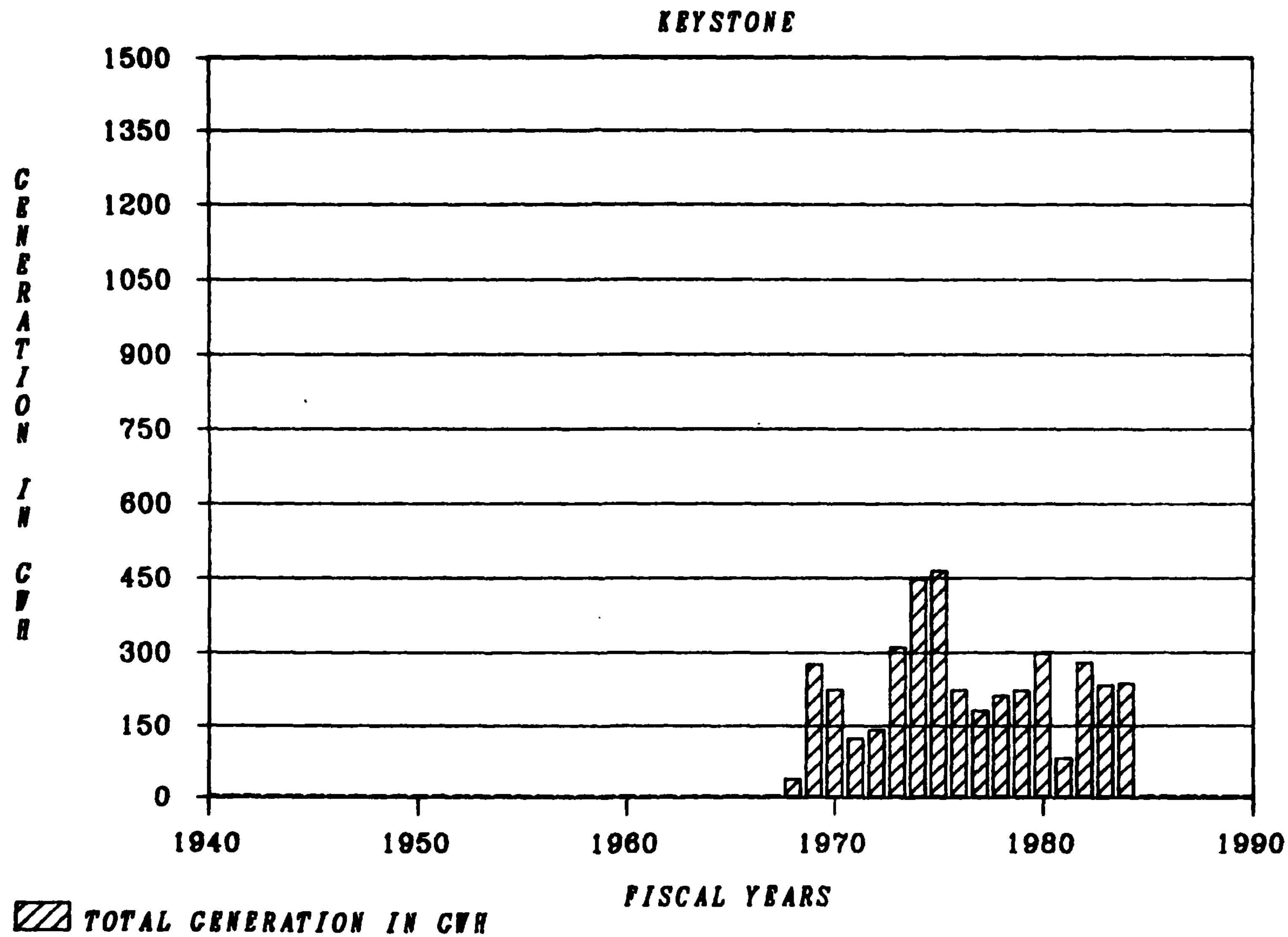
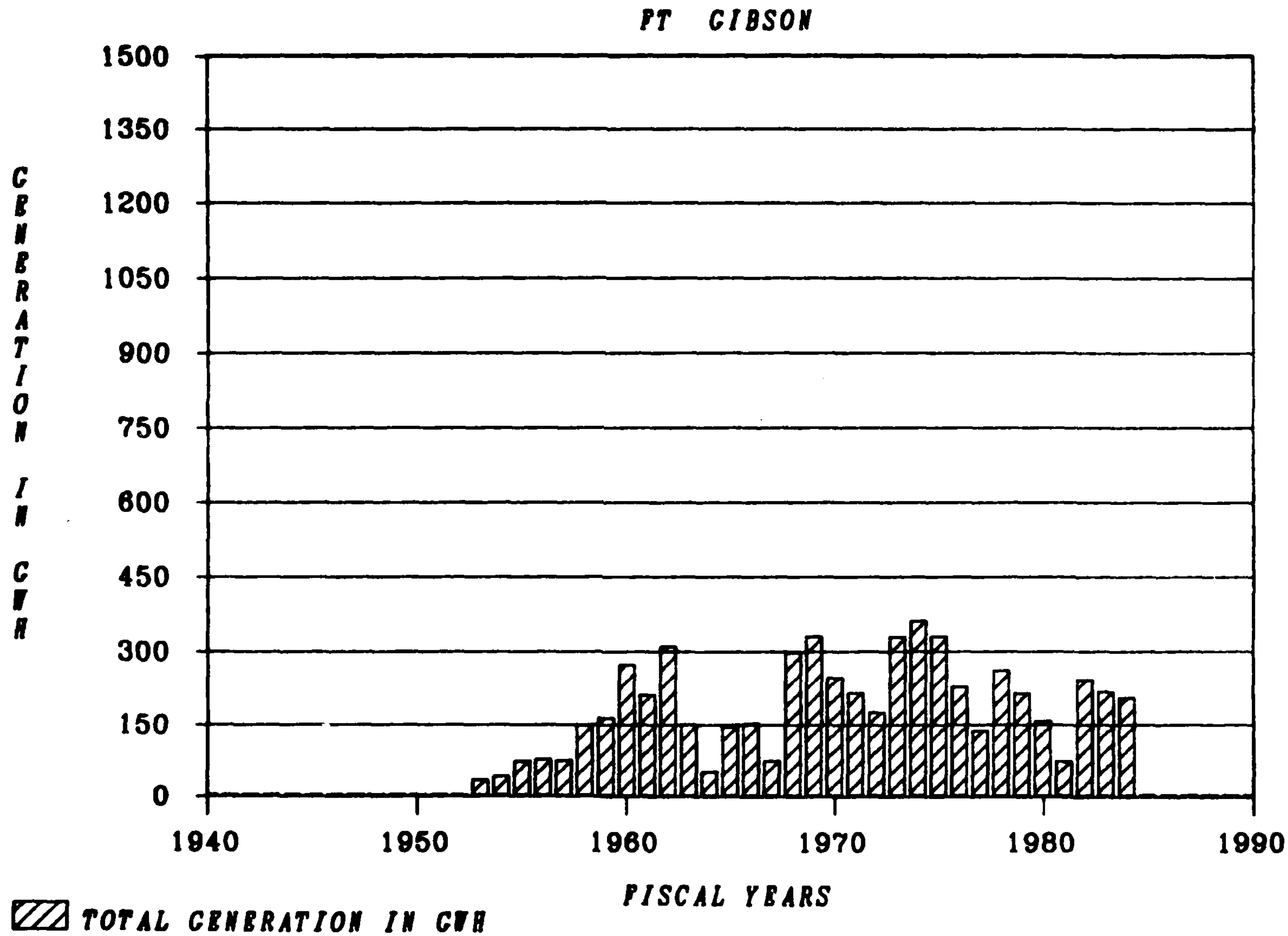
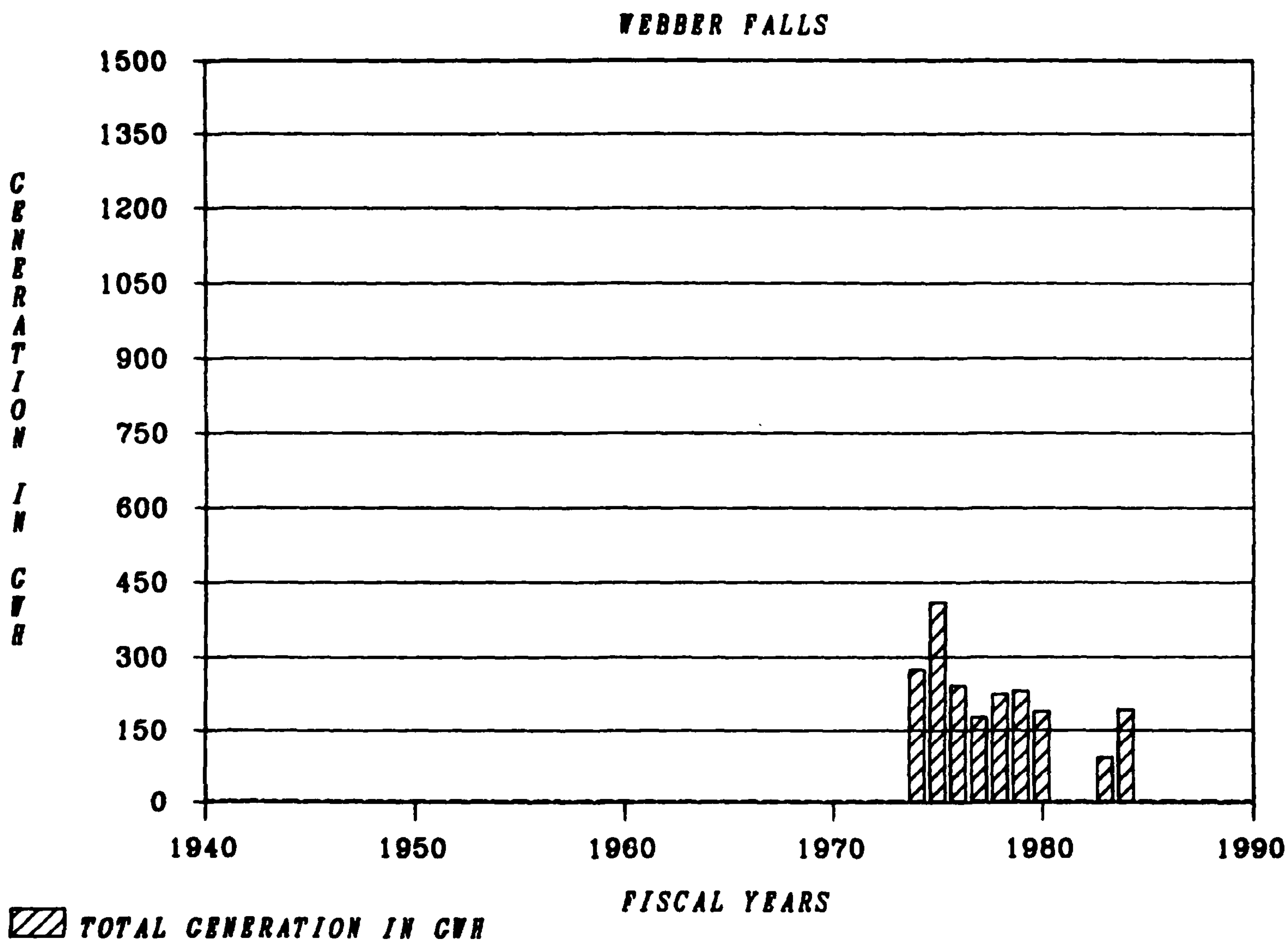

KEYSTONE
1500
1350
1200
1050
900
750
600
450
300
150
0
GENERATION IN GWH
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 6


FT GIBSON
GENERATION IN GWH
1500
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH



WEBBER FALLS
GENERATION IN GWH
1500
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 8

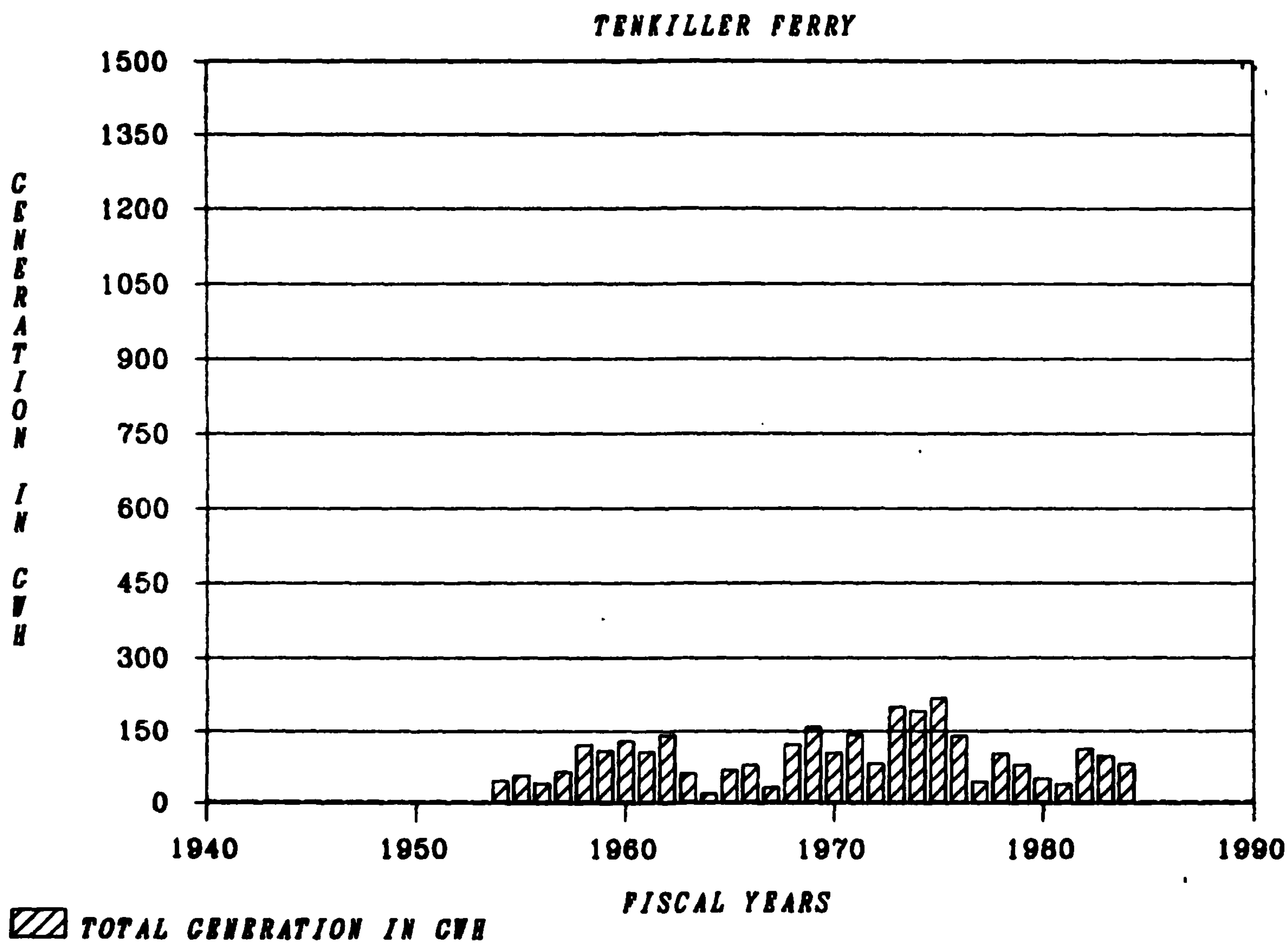
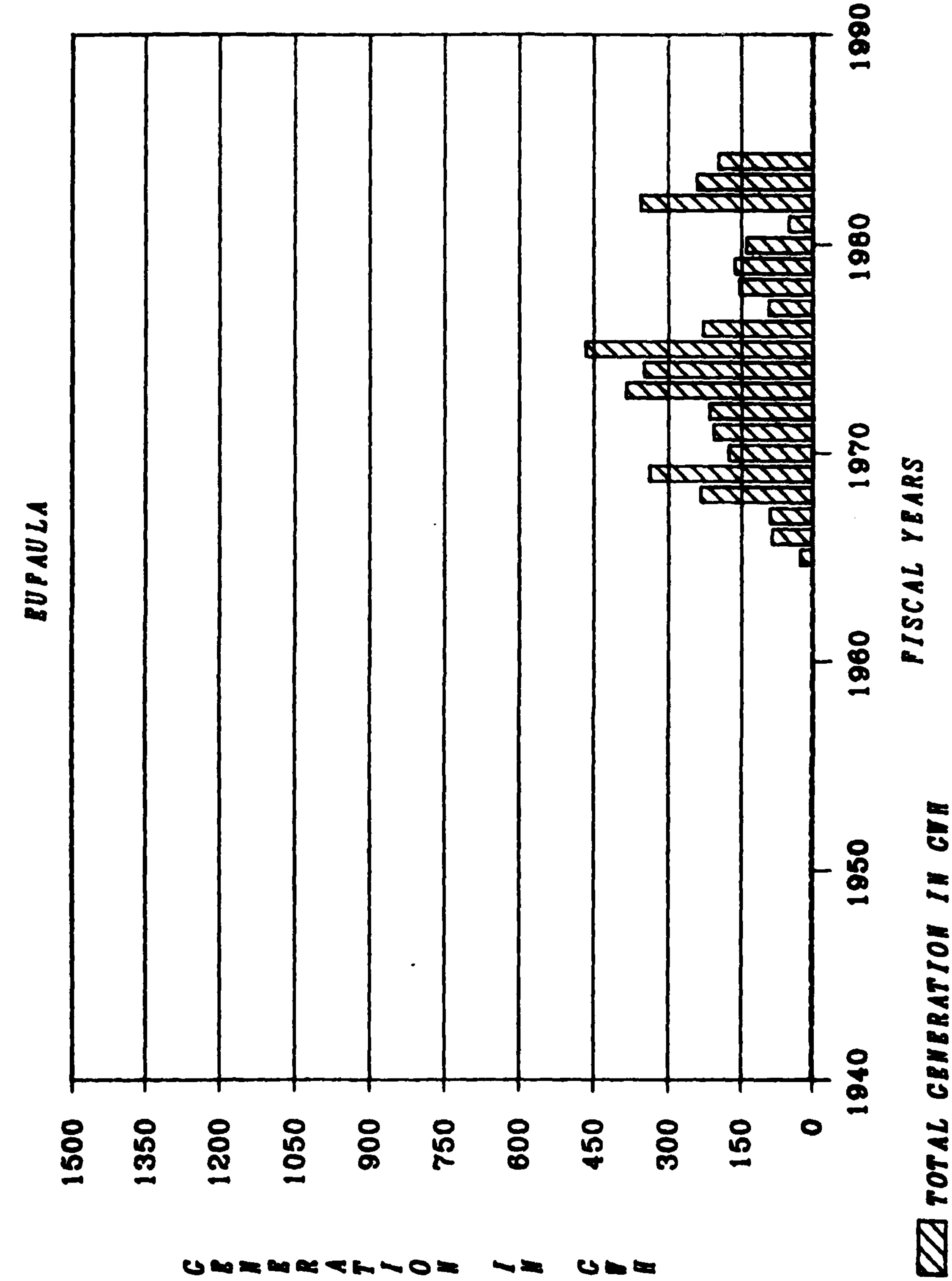
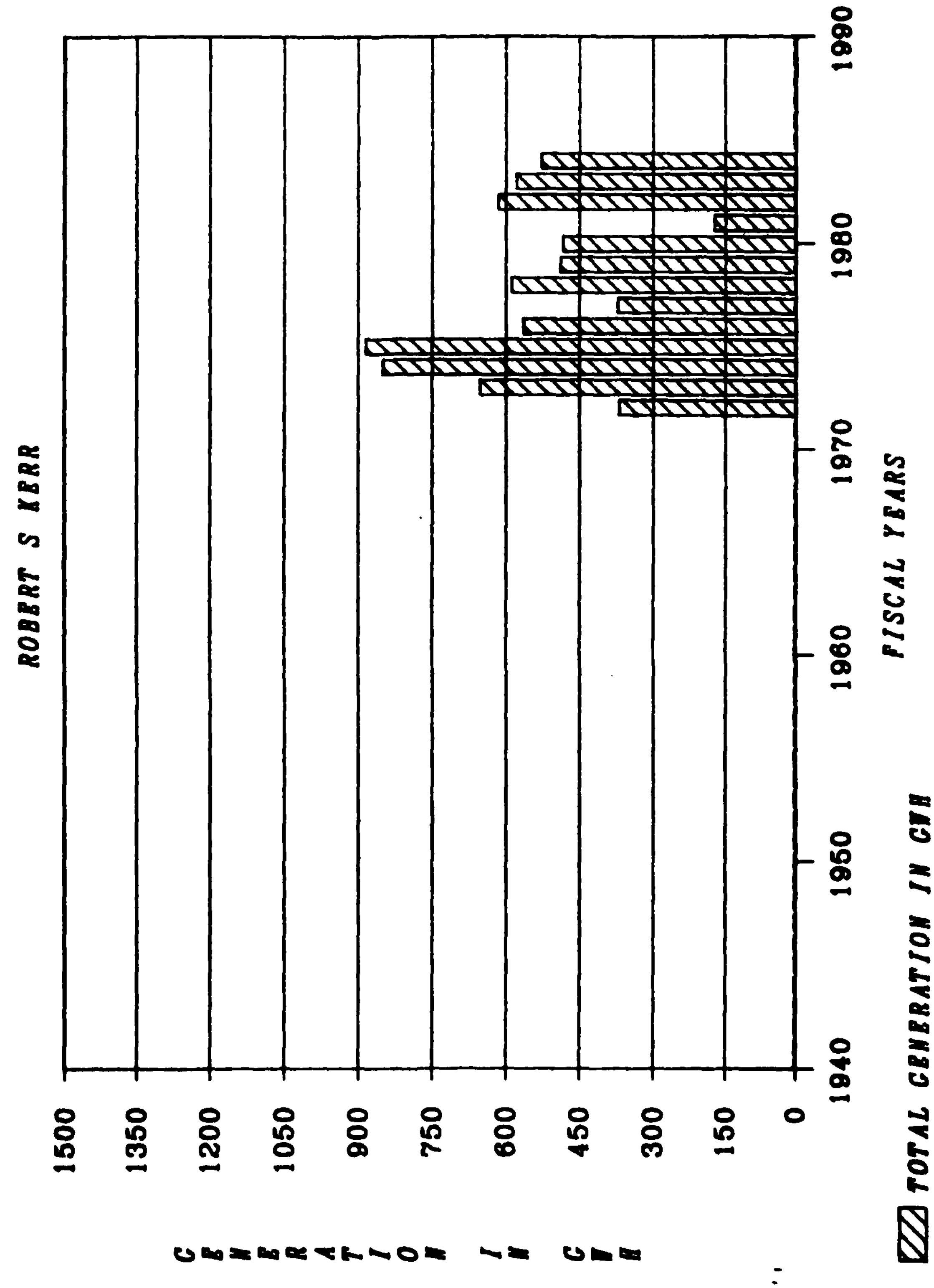

TENKILLER FERRY
1500
1350
1200
1050
900
750
600
450
300
150
0
GENERATION IN GWH
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 9



EUFAULA
GENERATION IN GWH
1500
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 10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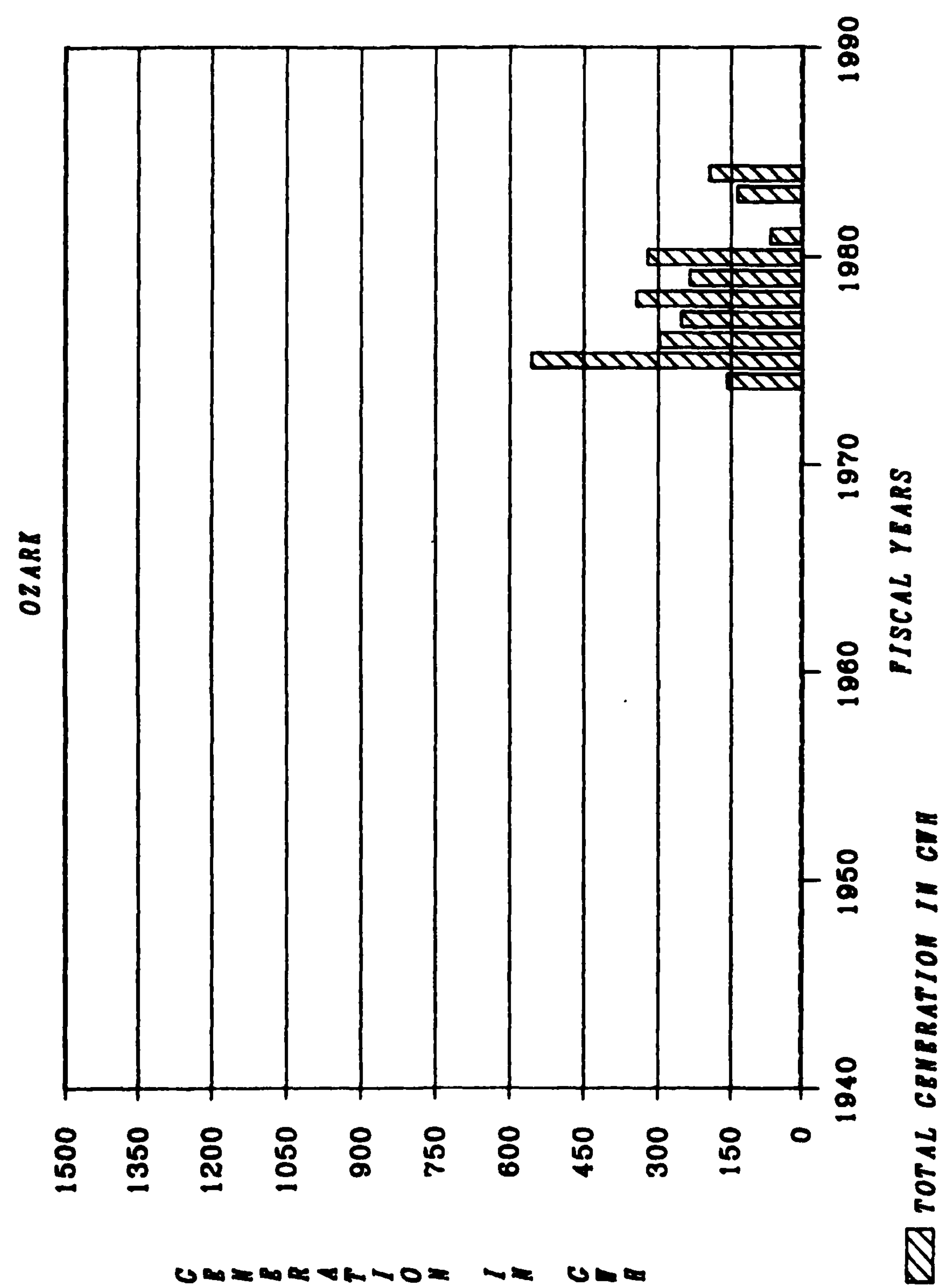
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 11



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GENERATION IN GWH
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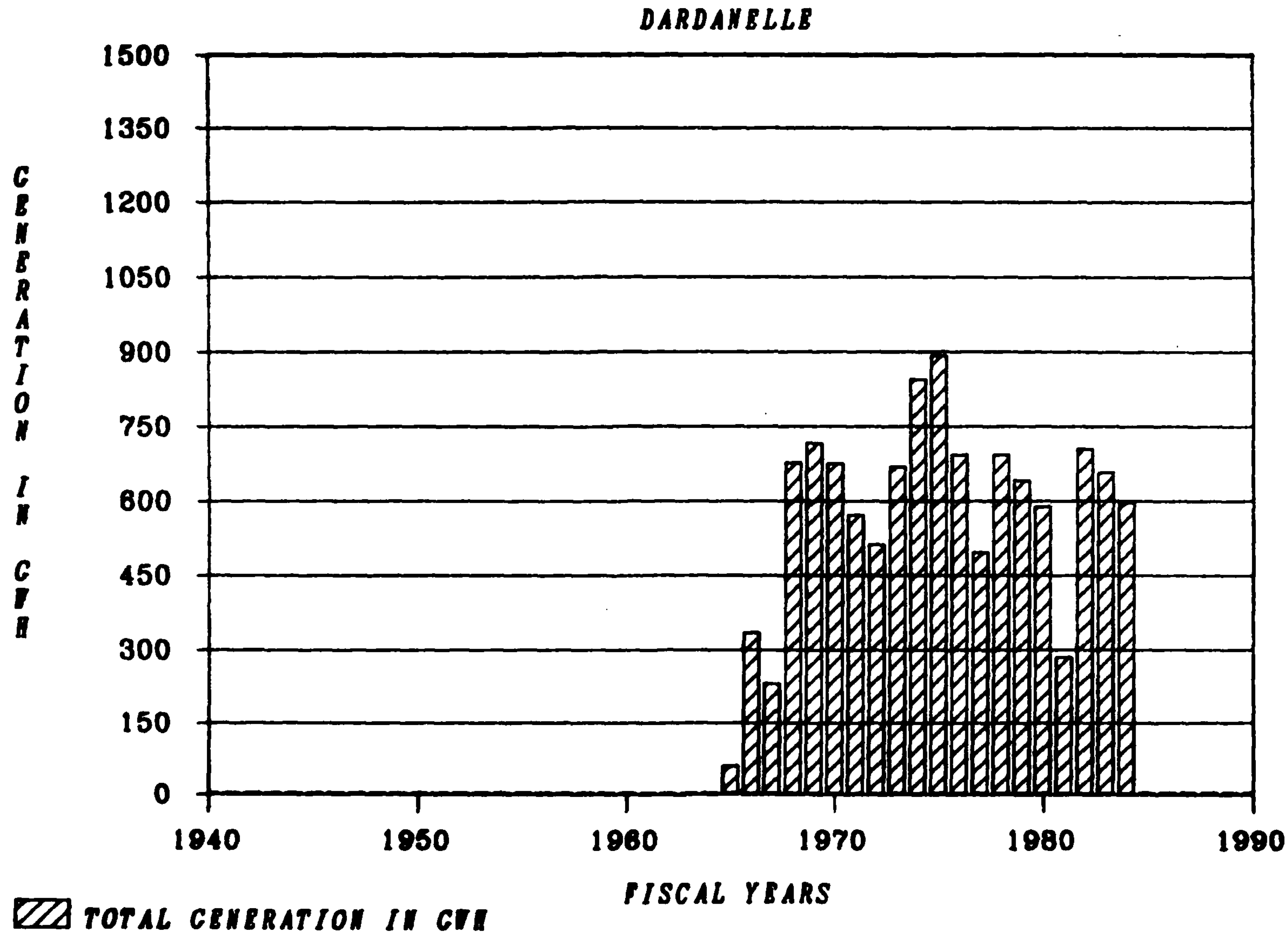
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 12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1350
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1050
900
750
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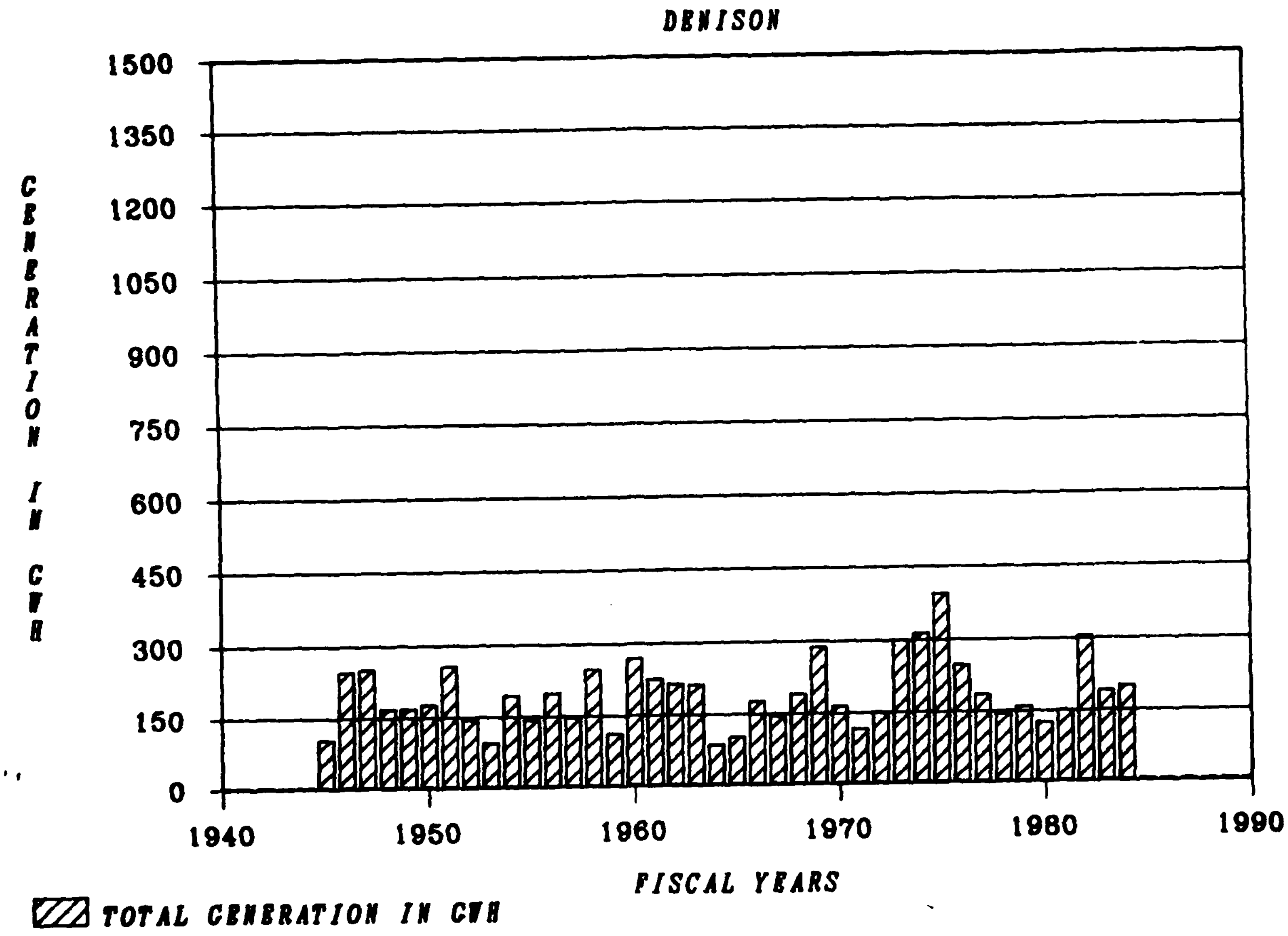
450
300
150
0
GENERATION IN GWH
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH



DENISON
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1350
1200
1050
900
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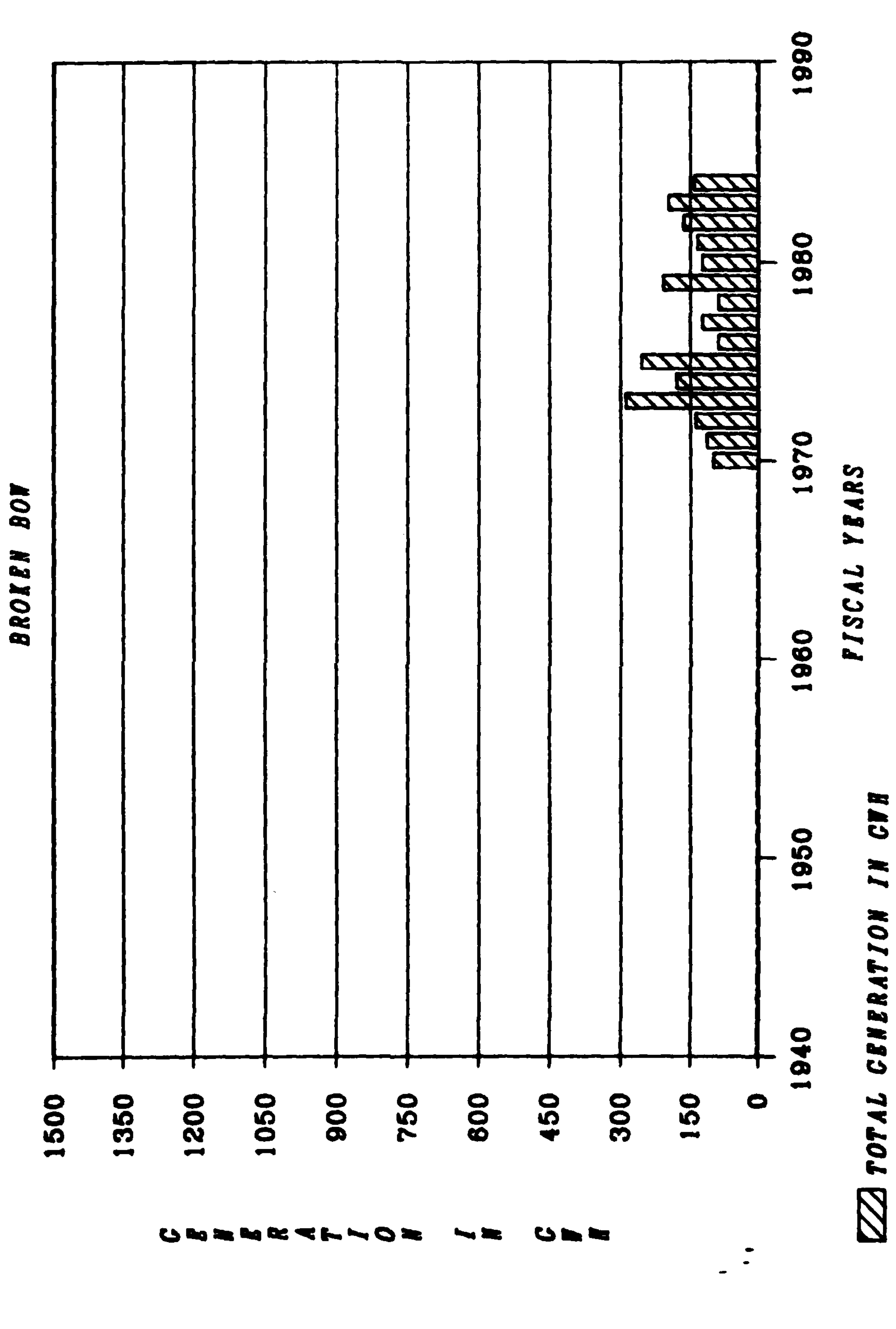
450
300
150
0
GENERATION IN GWH
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH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GENERATION IN GWH
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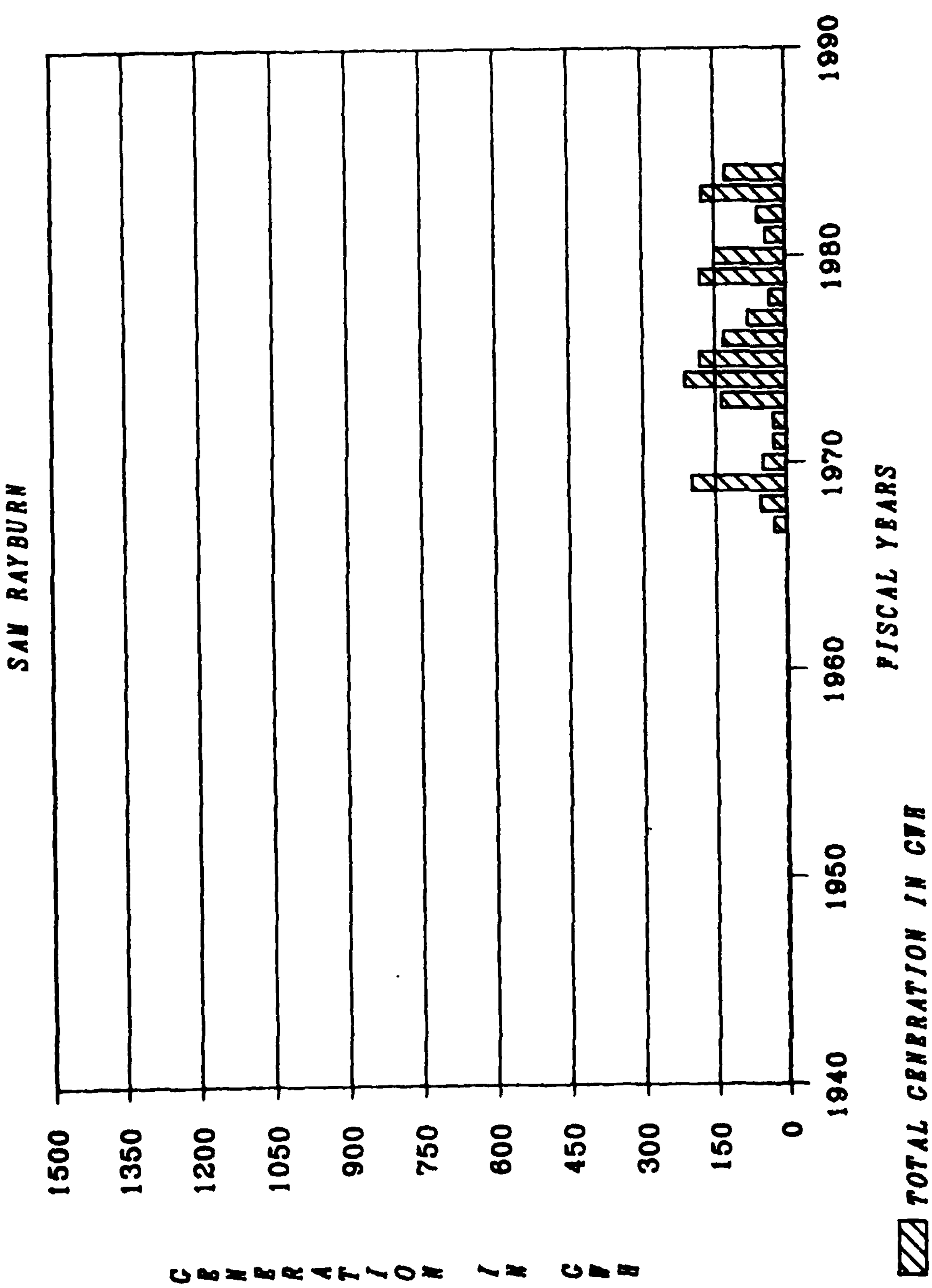
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

PLATE 15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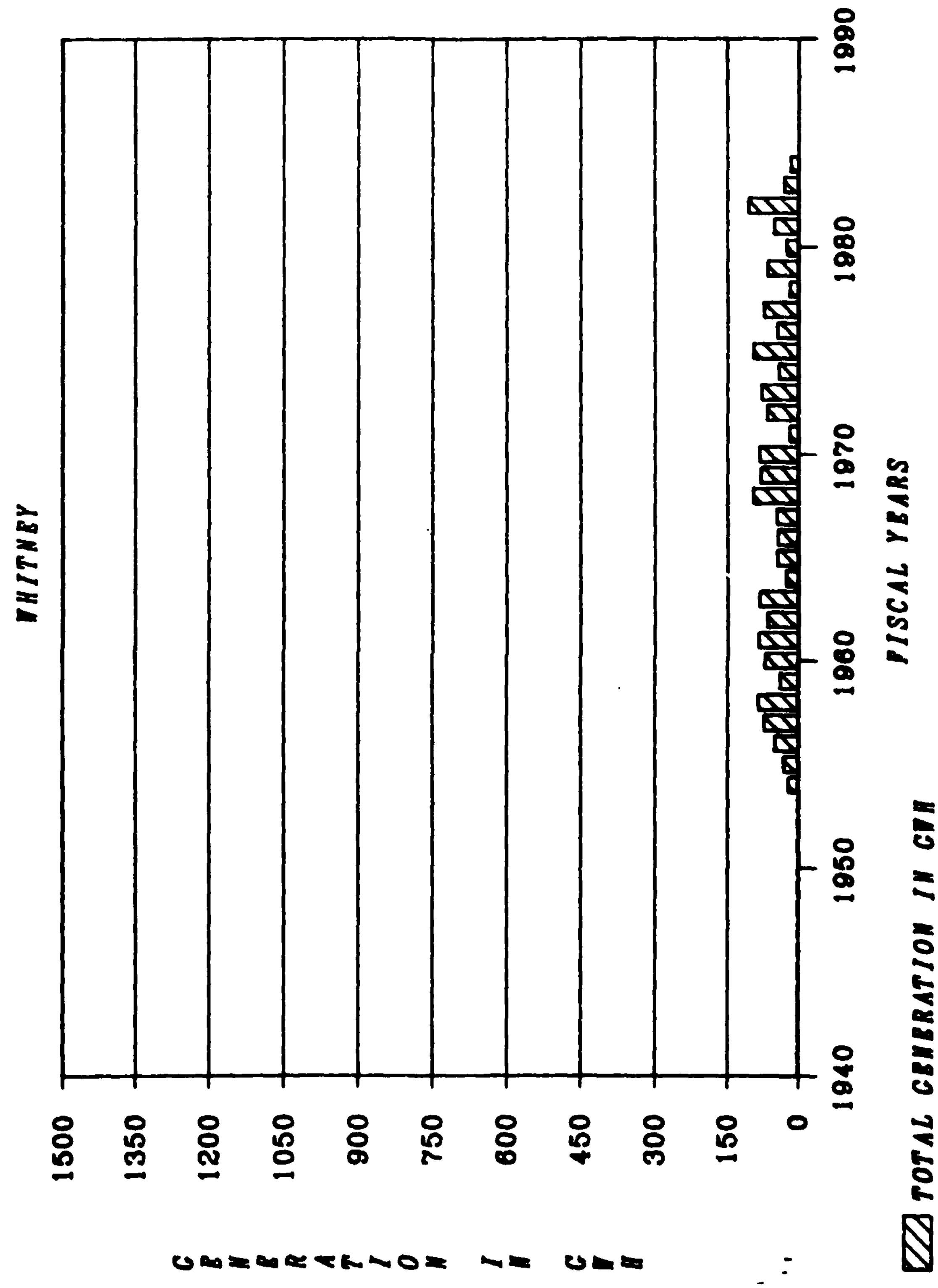
GENERATION IN GWH
1500
1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH


WHITNEY
GENERATION IN GWH
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1350
1200
1050
900
750
600
450
300
150
0
1940
1950
1960
1970
1980
1990
FISCAL YEARS
TOTAL GENERATION IN GWH

SECTION VI - DISTRICT WATER CONTROL ACTIVITIES

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SECTION VI - DISTRICT WATER CONTROL ACTIVITIES

1. **Project Visitation By Water Management Personnel.**

a. **Albuquerque District.** During FY 84 reservoir regulation personnel visited John Martin, Conchas, Abiquiu, Cochiti, Galisteo, Jemez Canyon and Two Rivers projects. These visits included all of the district projects with the exception of Trinidad and Santa Rosa. The section 7 projects (Platoro, Pueblo and Sumner) were not visited. The district has established a visitation schedule for all Corps projects that would enable water management personnel to visit each site annually. Section 7 projects would be visited every other year.

b. **Fort Worth District.** Four of the district's reservoir projects were visited by water management personnel during FY 84. Sam Rayburn and Town Bluff Dams were visited in February 1984 and O.C. Fisher and Hords Creek Dams were visited in June 1984. Water Control Manuals, flood and emergency operations procedures, potential flooding areas, shoreline and downstream erosion, and WCDS data collection were discussed with project personnel during these visits.

c. **Galveston District.** On 10 February 1984, Hydrology and Hydraulics personnel visited the Addicks Project Office to review operational procedures with project personnel. The briefing included day-to-day water control duties and a review of the various emergency regulation schedules. It was emphasized that the emergency schedules would be used only when communications with the District Office failed.

d. **Little Rock District.** During FY 84, Water Management Section personnel visited Table Rock, Bull Shoals, Norfork, Greers Ferry, and Clearwater Lakes to discuss problems affecting the operation of these projects, and to view the problem areas.

(1) The visit to Table Rock included a tour of the powerhouse, the oxygen injection system, the two dissolved oxygen monitoring stations in Lake Taneycomo, and the flood prone areas of Branson and Hollister, Missouri. The tour of the powerhouse included a "walk through" of what the operators must do to respond to a need to generate above the D.O. restriction, including opening the spillway gates and using the oxygen injection system. Also discussed was the recent practice of SWPA to rapidly load or unload all the units at Table Rock and Bull Shoals. This practice represents a potential safety problem and aggravates the bank caving downstream of these projects. The results of these discussions were a request to SWPA to limit loading or unloading the units at Table Rock and Bull shoals to two units per hour for normal operations.

(2) The visits to Bull Shoals and Norfolk Dams included tours of the powerhouses, the problem areas downstream of these projects, and the DCP sites at Calico Rock, Sylamore, and Ellis.

(3) The visits to Greers Ferry and Clearwater were to meet with the project personnel to discuss current operations and reporting procedures.

e. **Tulsa District.** Twenty-one projects were visited by Reservoir Control Section personnel this fiscal year. The projects visited and purposes for the visits are listed in the following table. In addition, personnel visited the Wichita-Valley Center, Kansas local protection project to check river gages and control structures.

PROJECT VISITATION
DURING
FISCAL YEAR 1984

PROJECT	PURPOSE OF VISIT
Altus	Site familiarization for water control manual contractor
Big Hill	Stilling basin inspection
El Dorado	Scheduled reservoir control visit
Fall River	Stilling basin inspection
Fort Cobb	Site familiarization for water control manual contractor
Great Salt Plains	Scheduled reservoir control visit
Grand	Scheduled reservoir control visit
Heyburn	Scheduled reservoir control visit
Hudson	Scheduled reservoir control visit
Hugo	Site familiarization
Hulah	Scheduled reservoir control visit
Kaw	Scheduled reservoir control visit
McGee Creek	Scheduled reservoir control visit
Oologah	Scheduled reservoir control visit
Pat Mayse	Scheduled reservoir control visit
R. S. Kerr	Scheduled reservoir control visit
Sardis	Scheduled reservoir control visit
Texoma	Scheduled reservoir control visit
Waurika	Scheduled reservoir control visit
W. D. Mayo	Scheduled reservoir control visit
Wister	Scheduled reservoir control visit

2. Special Reservoir Operations.

a. **Albuquerque District.** Abiquiu Reservoir stored snowmelt runoff beginning 15 April 1984 and reached a maximum pool elevation of 6228.9 (234,960 acre-feet) on 29 May. Approximately 1,700 acre-feet of flood water was carried over in storage, starting 3 July, and will be evacuated prior to the end of the calender year. Cochiti Reservoir stored water from spring runoff during the period 10 May to 12 June 1984. Maximum pool elevation was 5347.62 (76,685 acre-feet) on 29 May. On two separate occasions, 19-21 December 1983 and 11-13 January 1984, releases from Cochiti were reduced to aid in the search of a drowning victim in the vicinity of Soccorro, New Mexico. For the period 26-30 August 1984 Cochiti releases were increased to dilute raw sewage that was being discharged from a damaged sewer line in Albuquerque, New Mexico. Releases from Abiquiu Reservoir were used to replace the Cochiti Recreation Pool to its normal level and sustain Rio Grande flows to a desired dilution level until the line was repaired. John Martin Reservoir releases were terminated for about 2 hours, on 13 June, while divers searched for a drowning victim that was believed to be near the dam. Pueblo Reservoir, which is a Bureau of Reclamation project, had in temporary storage within the flood pool approximately 3,500 acre-feet of irrigation water for the period 5-13 June 1984. Two Rivers Reservoir had flood storage for the period 9-21 August 1984. At maximum pool, the storage was 2,230 acre-feet on 13 August.

b. **Fort Worth District.** Flood control operations were sporadic during the past year. Seven flood control projects out of the District's total of 22 used part of their flood control storage during the year. There were three requests for deviation from the District to the Division. Notable project operations are discussed below:

(1) Aquisition and installation of 12 rainfall gages and DCP's were accomplished by SWF to establish criteria for real-time forecasting procedures for the Upper Trinity River Basin. The DSS database is now operational and real-time forecasting for the Grapevine and Lewisville Lakes watersheds is possible.

(2) A direct line link between the National Weather Service Data General S/140 computer and SWF Harris 100 computer was installed. SWF now has real-time capture of NWS AFOS data.

(3) The City of San Angelo through the Upper Colorado River Authority requested and received State of Texas approval for use of up to 10,000 acre-feet of water stored in the sediment reserve storage space of the lake. The low lake level condition placed the elevation of the lake below the low flow conduit invert elevation, therefore outflow releases were made using the flood gates.

(4) The maintenance contract for painting the outlet conduit at Belton Lake restricted outflow releases from the lake, therefore the project was unable to supply its share of water supply needs to the Brazos River System. Brazos River Authority made a special request to the Forth Worth District to provide additional water to their system from Granger Lake.

c. **Galveston District.** The only special reservoir operation conducted at Addicks and Barker Reservoirs during FY 1984 was the closing of the reservoir gates for three days during August to allow the City of Houston to perform pier maintenance on bridges downstream of the reservoirs.

d. Little Rock District. FY 84 was a near "average year" from the standpoint of volume of water and water control activities. Annual rainfall and runoff was near normal for the District. Most of our flood control activity was during the months of March, April, and May. All of our 12 flood control lakes were utilized in flood control activities. The White River lakes experienced 2 to 5 rises, the Little River lakes experienced 5 to 8 rises, Nimrod and Blue Mountain Lakes had 7 rises each, and Clearwater Lake had 8 rises.

(1) Special operations or activities related to water control projects are summarized as follows:

(a) Little River System. Repair work on the stilling basin at Gillham Dam that began in September 1983 was expedited in early December so that it could be completed before releases were required because of heavy rainfall in late November and early December. The Little River lakes experienced 5 to 8 rises during FY 84.

(b) Arkansas River System. High flows in March and April created several shoals that required dredging as reported in paragraph 4. Navigation was maintained during the recession by using a limited "hinged pool" as long as possible, and then raising the navigation pools above the normal limits to maintain navigation depths. Favorable inflow conditions allowed the Tulsa District to provide a tailored navigation taper that aided in maintaining navigation during May and June while the shoals were being dredged.

(c) White River Systems. Greers Ferry Lake was drawn down below the spillway crest in August 1983 to paint the spillway gates. SWPA cooperated in maintaining the lake level below the spillway crest until the middle of February when runoff raised the lake level several feet. The lake was drawn down again by September 1984 to attempt to complete painting the spillway gates. The White River lakes experienced 2 to 5 rises during FY 84.

(2) Studies, reports, and investigations related to water control projects are summarized as follows:

(a) Table Rock Dissolved Oxygen study will be available for state and agency review in FY 85.

(b) The White Rive Lakes Restudy will be available in 1985. The study does not recommend any any significant changes in the functions or regulation of the project.

(c) Hydropower Studies on the Arkansas River and Tributaries have been completed on Murray Lock and Dam (first interim), Toad Suck Ferry Lock and Dam, and Locks and Dams 3, 4, 5, and 6 and Dam 2 (third interim). The first interim survey report is now in the Congress. The second interim survey report is at the Office of the Assistant Secretary of the Army for Civil Works. The third interim report is now at the Office, Chief of Engineers. Reconnaissance level studies have been completed on the fourth and final interim survey report which is the feasibility of additional capacity at Ozark and Dardanelle and pumped storage projects at White Oak Bayou and Petit Jean Mountain.

d. The Draft Preauthorizatin Survey Report on Norfork Units 3 and 4 is scheduled to be completed in April 1985. Six alternatives were considered during the study, but the most feasible alternative is the addition of two pumpback units and reregulation structure.

e. **Non-Federal Hydropower Development.** The coordination and review process is continuing on Federal Energy Regulatory Commission (FERC) permit and license applications for non-Federal hydropower development on projects within the Little Rock District in Arkansas. FERC licenses have been issued on Dam 2 and Locks and Dams 3, 9, 13, and Murray on the Arkansas River, and Millwood Dam on the Little River. License applications are pending on Gillham Dam and Lake in the Little River Basin and Dams 1, 2, and 3 on the White River. A preliminary permit has been issued at Toad Suck Ferry Lock and Dam. Preliminary permits are pending on Locks and Dams 4, 5, and 6 on the Arkansas River: Nimrod Dam and Lake on the Fourche La Fave River, Arkansas River Basin; Dierks dam and Lake on the Saline River; and Dequeen Dam and Lake on the Rolling Fork River, Little River Basin.

(3) Other significant items relating to water management activities are as follows:

a. **Water Control Data System (WCDS).** Water Management personnel are utilizing applications software developed by LRD on the H500 to manually enter all daily reservoir data, perform water budget computations, and prepare daily reports and forecasts. The H100 presently communicates with the NESS downlink to receive DCP data. Plans are currently underway to switch to the Fort Worth downlike as the primary data collection source. The H100 is transmitting the raw data to the H500 for processing. The first "real time" utilization of the DCP data in LRD occured on 25 November 1983. DCP data are currently being stored in DSS (DATA STORAGE SYSTEM), a data base developed by HEC. Applications programs from HEC allow users to view, edit, and plot collected data.

b. **DCP Status.** During FY 84 LRD purchased 42 DCP's. The LRD activated 78 platforms in FY 84 bringing the total number of operating stations to 85. Plans are to activate seven more platforms in FY 85.

c. **Acoustic Velocity Meter.** The installation of the equipment for automated flow measuring station in the Arkansas River just downstream of Dardanelle Dam was completed 16 August 1984. The manufacturer of the Acoustic Velocity Meter (Sarasota) is working with the DCP manufacturer (Synergetics) in tracing down an electronic bug in the system. USGS will begin the final calibration soon.

e. **Tulsa District.** Two noteworthy floods occurred in the Tulsa District during fiscal year 1984. The first was the storm of October 17-21, 1983 which caused flooding in areas of south-central Oklahoma and north Texas. The storm system was caused by the passage of successive Pacific cool fronts combined with the remnants of Hurricane Tico. Total rainfall amounts ranged from 10-17 inches across southwestern and central portions of Oklahoma. The Red River between Texas and Oklahoma reached record high stages at the Burkburnett, Terral, and Gainesville gages, helped by record or near-record inflows from the Pease River in Texas, the Salt and North Forks of the Red River in Oklahoma and Cache and Beaver Creeks in Oklahoma. Extensive flooding resulted as major rivers and creeks overflowed. The Washita River in Oklahoma sustained its highest stages since 1949 between Mountain View and Maysville at gaging stations near Carnegie, Anadarko, and Alex. The Deep Fork River Basin received from 8 to 15 inches of rain along its length, causing a high and prolonged rise in its lower reaches. Widespread flooding occurred in the city of Guthrie, Oklahoma, as an area ten blocks long

and five blocks wide was covered by an estimated 6 feet of water when Cottonwood Creek and the Cimarron River overflowed. Some of the more devastating tributary floods in Oklahoma were along Cottonwood Creek from Seward to Guthrie, Walnut Creek from Washington to Purcell, and East Cache Creek from Apache to Lawton. Maximum pool elevation records were established at Waurika Lake, Lake Thunderbird, and Lake Kemp during the October 1983 flood. The Waurika Lake level increased 12.1 feet (10.3 feet above normal), making the flood control pool 92 percent full. Lake Thunderbird level increased 10.1 feet (8.4 feet above normal), making the flood control pool 77 percent full. The Lake Kemp level increased 10.8 feet (2.2 feet above normal), making the flood control pool 16 percent full. This flood is described in a report dated January 1984 entitled "Post-Flood Report, Oklahoma and Texas, Flood of October 17-21, 1983".

The second noteworthy flood in fiscal year 84 was the Memorial Day weekend storm at Tulsa. On the evening of 26 May and the morning of 27 May thunderstroms developed and redeveloped over the Tulsa area dropping as much as 13 inches of rainfall in some areas, resulting in the most costly flooding in the city's history. Damages were estimated at about $90 million. Fourteen lives were lost. The storm was limited to Tulsa area and had little impact on the nearby storage reservoirs. The outflow at Webbers Falls Lock and Dam increased from 10,000 c.f.s. to 115,000 c.f.s. in less than 24 hours as a result of the Tulsa storm.

Two navigation tapers were run this year. The first extended from mid-March to late May and the second from late May to early July. Record high pool elevations also occurred this year at El Dorado, Big Hill, Copan, Birch and Skiatook Lakes.

John Redmond Reservoir was drawn down 6 feet to elevation 1033.0 in August to facilitate maintenance on the spillway tainter gates. The maintenance was completed in August; however, the pool receded in September to elevation 1032.71, its lowest level since the conservation pool filled in November 1964.

Canton Lake was also drawn down 7 feet in August to allow repairs to the riprap on the face of the dam. This work will require about 6 months to complete.

3. **Water Quality Program and Activities**

a. **Albuquerque District:**

(1) The goals of the District water quality data collection program are to provide an accurate picture of lake conditions as to pH, turbity, temperature, and dissolved oxygen. Trends are monitored to show improvement or degradation of water quality and the data used to identify public health, fish and wildlife problems.

(2) Readings are made on a monthly basis for the following parameters; surface pH, secchi disk, and dissolved oxygen and temperature at surface and one-meter increments to the bottom. This data is available in the District Operations Office. The following is a listing of sampling locations for each project:

WATER QUALITY SAMPLING LOCATIONS

PROJECT	LOCATIONS	NUMBER
Abiquiu	Chama inflow, Canones inflow, reservoir near dam, release	4
Cochiti	Bland canyon, reservoir near dam, release	3
Conchas	Conchas and Canadian inflow, reservoir near dam, irrigation headworks	4
John Martin	Arkansas inflow, reservoir near boat ramp, reservoir near dam, reservoir near Ft. Lyon Hospital, two Lake Hasty locations, release	7
Trinidad	Purgatoire inflow, reservoir near dam, reservoir near Carpios ridge	4
Jemez Canyon	Inflow, reservoir near dam	2
Santa Rosa	Pecos inflow, reservoir near dam, reservoir near asphalt pit, release	4

(3) Biological samples are tested monthly at all projects. District personell are trained in the use of a gas chromatograph to test for dissolved nitrogen. Tests at Santa Rosa are planned for hardness and sulfate to monitor effects of gypsum deposits in the reservoir.

(4) Funds have been approved for research on algal blooms in Cochiti and Abiquiu Lakes. Negotiations with the University of New Mexico will start in November 1984, with actual research to begin in the spring of 1985.

b. **Fort Worth District:**

(1) For Fiscal year 1984, water quality reports on Bardwell and Whitney Lakes were completed and submitted to the Division Office for approval. Of the 22 lakes in the district, water quality reports for 10 lakes have been completed and no major water quality problems have been encountered in any of these lakes. Water quality reports for Belton, O.C. Fisher and Waco Lakes are scheduled for submission in Fiscal year 1985.

(2) In accordance with requirements of ER 1130-2-334, water quality monitoring by the U.S. Geological Survey under the cooperative program is continuing at the following lakes:

Aquilla Lake

Whitney Lake

Georgetown Lake

Granger Lake

Somerville Lake

(3) The U.S. Fish and Wildlife Service expressed concern regarding water release temperatures from Canyon Lake. Specifically, dry years create periods of temperature stress for Texas Parks and Wildlife's tailrace trout fishery, therefore when the Guadalupe Blanco River Authority (GBRA) contracts for the sale of additional reservoir yield for hydropower generation the problem will be compounded. As a potential solution to this problem the U.S. Fish and Wildlife Service suggested installation of multi-level water intake on the outlet tower. Preliminary analysis on historical monthly temperature profile data from January 1972 through December 1983 indicated that with the existing intake port at elevation 775.0, Canyon Lake is capable of discharging water at temperatures that will satisfy the cold water release temperature objective of 70°F or less for trout throughout the year. However, there is insufficient discharge temperature data to verify a definite conclusion. Presently withdrawal from Canyon Lake is from the low-flow intake structure at an invert elevation 775.0 feet and is the lowest elevation from which water can be withdrawn. A multi-level intake with ports located at higher than the existing intake elevation would be suited for continuous warm water releases. A thermal stratification study, involving the use of numerical modeling, is needed for a more detailed evaluation of Canyon Lake discharge temperature under present and future water supply release conditions. The U.S. Fish and Wildlife Service has been informed that this type of study has not been funded and therefore no work has been initiated.

(4) A Heat Budget Analysis Study of Cooper Lake is in progress and is expected to be completed before 31 December 1984.

c. Galveston District. A draft report, for the three year quality program to show the effects of the length of impoundment on quality and determine the release rates which produced the most improvement downstream, on Addicks and Barker Reservoirs has been completed by the U.S. Geological Survey. The report is in the process of being revised and should be available during FY 1985.

b. LITTLE ROCK DISTRICT. The overall goal of the water quality management program is to improve or maintain water quality in the Little Rock District projects at the highest level possible, consistent with each project's purpose, design, and funding. The District water quality management programs are divided among various elements of the Construction-Operations and Engineering and Planning Divisions by functional missions.

(1) Construction-Operations Division Responsibilities. The Permits Branch has been given the responsibility for conducting the District water quality program for Construction-Operations Division. The branch is composed of a Permits and Water Quality Section and a Compliance and Data Collection Section. Since the regulatory functions of the branch under the Section 10/404 permit program closely parallel functions of the division's water quality management program, field activities are very conveniently and efficiently combined to implement the programs. This is primarily due to the related procedural and logistical and requirements of both regulatory functions and water quality activities. These responsibilities include the following programs relating to water quality management.

(a) **Lake Monitoring.** General lake water quality monitoring of all Little Rock District lakes other than the main stem of the Arkansas River is presently performed three times per year on each lake at six to eight stations at various depths. The fieldwork is done by USGS personnel under the Corps of Engineers Interagency Agreement. Approximately 26 parameters are measured to ascertain general lake water quality and to provide background data in detecting water pollution. There are no State or other Federal programs which routinely provided these data on the reservoirs operated by the Corps. Data obtained are maintained in the Permits Branch and are available from STORET and annual USGS water Resources Data Publications for Arkansas and Missouri. Data obtained are used to evaluate basic water quality, long and short term water quality changes, identify pollution sources, and properly manage lake water quality. Their evaluations include the identification of potential pollution sources so as to enable the Corps to have meaningful input in the decision making processes of other agencies and groups with regulatory authority over basin discharges. These findings are published in Water Quality Management Reports and annual updates for each project. The Greers Ferry and Table Rock Water Quality Management Reports have been published and the Blue Mountain report is in progress. A statistical analysis has been performed on data collection thus far (1974-present) and has proved to be very valuable. Bottom sediment samples have recently been collected from eight LRD lakes and are being analyzed for organics, nutrients, and metals.

(b) **Discharge Permit and Operational Monitoring.** Monitoring of Corps-operated wastewater treatment systems in Missouri and Arkansas is performed in accordance with NPDES permit requirements. The USGS obtains the necessary monthly samples and analyzes these for BOD, bacteria, and suspended solids. Operational monitoring performed twice weekly by the sewage treatment plant operators includes in some cases P^H, flow, chlorine residual, dissolved oxygen, and settleability. Operational changes are recommended as necessary. This program is conducted in accordance with Section 402 of the Clean Water Act which requires quarterly reporting to Department of Natural Resources in Missouri and U.S.E.P.A. in Arkansas.

(c) **Bathing Beach Monitoring.** Monitoring is performed five times monthly by resident area personnel on District bathing beaches during the swimming season to insure safe bacteriological quality of lake waters. Samples are analyzed by the Missouri and Arkansas Health Department free of charge. A central log containing results for all projects is maintained by the Permits and Water Quality Section. This program is administered in accordance with SWD Regulation 1130-2-9 and applicable State laws.

(d) **Portable Water Monitoring.** Portable water supplies of the District are tested for physical, chemical, and bacteriological quality to insure their adequacy and safeness. Bacteriological samples are collected by resident area personnel and mailed to the appropriate health departments, which presently perform the analysis free of charge. When tests indicate a bacteriological problem, corrective measures are immediately taken. Permits Branch personnel collect samples for complete chemical analysis by the health departments on each new water supply and for periodic nitrate analysis thereafter. Data obtained are used in an annual sanitary survey and report forwarded to SWD for reporting to OCE. This program is conducted as per ER 1130-2-407 and applicable Federal and State drinking water standards for noncommunity water supply systems.

(e) **Dredged Material Analysis.** Periodically, a bottom sediment survey is performed at eight locations along the Arkansas River navigation project and less

frequently at other locations on other District rivers and lakes. Sediment and water column samples are frozen and sent to SWD laboratory for sediment, water, and elutriate analyses. The purpose of this program is to detect potential effects of dredging operations on water quality, and to have these data available for future dredging proposed and the required 404(b) evaluations. These operations include both commerical dredging under Corps permits and channel maintenance dredging performed under Corps of Engineers contracts.

(f) **Pollution Complaints and Hazardous Substances.** Permits Branch and Resident Offices receive calls reporting instances of pollution and hazardous substances spills and coordinate these reports with appropriate Federal and State officials. On occasion, Corps personnel investigate these pollution complaints to verify existing conditions and determine effects on project operations. During oil and other hazardous substance spills, Corps personnel participate in emergency containment and cleanup measures with Coast Guard and EPA officials and when so designated, act as the Federal on-scene coordinator for these two agencies under the National Contingency Plan. The LRD Oil And Hazardous Substances Pollution-Contingency and Spill Prevention, Containment and Countermeasure Plan was rewritten and updated as of August 1983. Twice in the last 5 years LRD has disposed of PCB's from electrical and hydraulic equipment under contract after extensive coordination and obtaining appropriate approvals.

(g) **Special Activities.** The Chief, Permits Branch, presently serves in an ex-officio capacity on the Beaver Lake Water Quality Advisory Committee, a committee established by the Arkansas Department of Pollution Control and Ecology to study the point and non-point sources of pollution in the Beaver Lake drainage basin and make recommendations to the Department for solutions to the problems being experienced there. Permits Branch occasionally assists Engineering and Planning Division in obtaining samples and analyses for special water quality studies conducted by that division, such as for planning purposes. Coordination is also accomplished with studies being performed by other agencies such as EPA, Health Department, Soil Conservation Service, etc. Cooperative water quality studies are periodically conducted with other agencies in monitoring activities authorized under Corps Section 10 and 404 permits. Permits Branch personnel are also involved on a daily basis with Personnel of Arkansas Department of Pollution Control and Ecology in the processing of Corps permits and resolving the water quality matters arising therein.

(2) **Engineering and Planning Division Responsibilities.** There is no specific organization for water quality studies within Engineering and Planning Division. Responsibility is assigned to the various elements based on the nature of the program or study.

(a) **Lake Profile and Release Monitoring.** Water quality data have been collected at Beaver, Table Rock, Bull Shoals, Norfork, and Greers Ferry Lakes since 1966; at Blue Mountain, Clearwater, and Nimrod Lakes since FY 81; and at DeQueen, Dierks, Gillham, and Millwood Lakes since April 1981. Presently, monthly profiles of pH, temperature, dissolved oxygen, and specific conductance are obtained from the 12 lakes, as well as a grab sample below each dam. Additional profiles are obtained from Table Rock Lake during critical times of the year. These data are used in the design of the operating

features needed for preventing or lessening water quality problems downstream of the dams. They also contribute to the water control management activities required to maximize dissolved oxygen concentrations in the fall releases from Table Rock and to maintain acceptable temperatures downstream of all lake projects from May through October. Hydraulics Branch is responsible for this program and data collection is contracted to USGS.

(b) Special Studies. The Planning and Hydraulics Branches periodically conduct water quality studies as part of normal project planning efforts such as preparation of survey reports, design memorandums, and environmental impact statements. Certain special water quality related studies are identified below:

White River Lakes Study. The study includes an evaluation of how the release schemes of Bull Shoals, Norfork, and Greers Ferry Lakes might be modified to minimize adverse water quality impacts downstream.

Taylor Bay Siltation Study. This study investigated the effects of suspended sediment on fishing in Taylor Bay near Augusta, Arkansas. The sources of the silt were identified and alternate solutions were developed. Nine measures have been identified for consideration as solutions. The study is scheduled for completion in 1985.

(3) Laboratory Capabilities. Water quality analyses performed at the District level are limited to the following capabilities:

(a) Field testing of water quality which may be conducted by Corps personnel includes dissolved oxygen, temperature, pH, specific conductivity, Secchi Disc measurements, and others using HRCH field test kits approved by EPA.

(b) A small laboratory located in Construction-Operations Division can perform the following analyses: dissolved oxygen, color, turbidity, alkalinity, hardness, and others using colorimeter methods for analyses.

(4) Data Management. Lake water quality data collected and analyzed by USGS are entered into WATSTORE and STORET, the computerized data management systems of the USGS and EPA, respectively. These data are also published in the annual USGS water resources reports for Arkansas and Missouri. Results of potable water, bathing beaches, NPDES, and other monitoring are kept in log books or files as appropriate. Special data collection results are contained in the reports dealing with the specific subject for which data were collected.

e. Tulsa District. The Tulsa District's plan to determine existing water quality at all operating projects was continued in fiscal year 84. To date, 18 of 35 operating projects have been surveyed. During this past fiscal year, Council Grove Lake, Kansas, and the Arkansas River Navigation System in Oklahoma from Webbers Falls Lock and Dam to Robert S. Kerr Lock and Dam were surveyed. In addition, special studies were undertaken at Lake Texoma, Oklahoma and Texas; Keystone Lake, Oklahoma; the Arkansas River below Keystone Dam; Hugo Lake, Oklahoma; and Hulah Lake, Oklahoma.

(1) Council Grove Lake, Kansas. This study concentrated on the water quality in the Neosho River between Council Grove Lake and the upper end of John Redmond

Lake, a stretch of 47 miles. The purpose of this study was to examine the suitability of the present release schedule for downstream water quality as it relates to other water uses, particularly water supply. This data will be analyzed in fiscal year 85 to predict the minimum releases needed to meet downstream State quality standards.

(2) Arkansas River Navigation System - Webber Falls to Robert S. Kerr. Water quality studies were continued on the Navigation System to determine the effects of navigation traffic on water quality. This portion of the system is used for water supply. This data will be analyzed in fiscal year 85 to predict the minimum releases needed to meet downstream State quality standards.

(3) Lake Texoma and Keystone Lake. Water quality data collected from past years on these two projects were analyzed by the use of water quality models. The models were used to describe the relationships between and among several parameters e.g., D.O., temp, conductivity, chlorides, and the end results will be a predictive model for each lake based on certain parameters. The results will be analyzed this fiscal year.

(4) Arkansas River below Keystone Dam. A study was made to determine minimum flows needed from Keystone Dam to meet downstream dissolved oxygen standards. The information will be used to evaluate the cost of various options for providing needed flows. The EPA QUAL-II water quality model was calibrated and verified against observed conditions for D.O. and temperature. The model was used to predict the length of the dissolved oxygen sag zone below Keystone Dam and the minimum flow required from Keystone Lake each month under 100-year drought conditions to allow permitted discharges to meet State dissolved oxygen standards.

(5) Hugo Lake, Oklahoma. The Hugo Lake study concentrated on the water quality in the Kiamichi River reach below Hugo Dam to the confluence of the Kiamichi River with the Red River. The purpose of the study was to determine the volume of releases needed to maintain downstream water quality State standards. Data analysis will be completed in fiscal year 85.

(6) Hulah Lake, Oklahoma. This study concentrated on the water quality in the Caney River below Hulah Dam to near the city of Bartlesville. The purpose of the study was to determine the volume of releases needed to maintain downstream water quality State standards. Data analysis will be completed in fiscal year 85.

4. SEDIMENT PROGRAM AND ACTIVITIES.

a. Albuquerque District. Galisteo Reservoir was resurveyed in August 1983 with revised area capacity data scheduled for implementation on, January 1985. Jemez Canyon Reservoir was resurveyed in December 1983 and revised area- capacity data is also scheduled for use starting 1 January 1985. A hydrographic survey was completed at Abiquiu Reservoir in July 1984. Revised area-capacity data is scheduled for completion by December 1984 with the new data to go in use 1 January 1985.

b. Forth Worth District. Funds requested for sedimentation resurvey of Waco Lake for Fiscal Year 1984 were not approved. Consequently, no sedimentation resurveys were accomplished in Fiscal Year 1984.

c. Galveston District. No sediment work was conducted at either Addicks or Barker Reservoirs during FY 1984. Dredging in conjunction with navigation is shown in the following table.

NAVIGATION PROJECTS - DREDGING
(Cubic Yards)

Project	FY 83	FY 84 1/
Brazos Island Harbor	1,084,438	3,998,484
Channel To Port Bolivar	68,846	---
Corpus Christi Ship Channel	2,770.927	2,039,263
Freeport Harbor	2,260,119	---
Galveston Harbor	---	4,487,405
Houston Ship Channel	960,000	8,313,411
Matagorda Ship Channel	1,864,023	3,403,148
Sabine-Neches Waterway	3,523,328	11,325.938
Trinity River Channel	---	267,810
SUBTOTAL	12,531,681	33,835,459
GIWW		
Sabine River to Galveston	3,811,219	437,266
Galveston to Corpus Christi	7,499,560	7,804,075
Corpus Christi to Mexican Border	2,567,575	1,962,781
SUBTOTAL	13,878,354	10,204,122
TOTAL	26,410,035	44,039,581

1/ Premliminary Data Subject to Revision

d. LITTLE ROCK DISTRICT.

(1) Summary of Activities. Suspended sediment samples are collected at 17 stations. The 247 sediment ranges on the main stem of the Arkansas River are resurveyed as near annually as funds and survey workload permit. October 1983 through September 1984, there were 173 ranges scheduled for resurveying; 158 resurveys were accomplished. There are 143 ranges scheduled to be resurveyed in FY 85. Fifty-six tributary ranges are resurveyed less frequently when appreciable deposits are suspected. About 50 index ranges out of 350 sediment ranges in the other eight lakes are resurveyed at 10-year intervals. During the period from October 1983 through September 1984, none were resurveyed. No other lakes are scheduled for resurvey during FY 85.

(2) White River Entrance Channel Model. The Entrance Channel Model is a physical, movable bed hydraulic model which has been constructed at Waterways Experiment Station (WES) to study the navigation depth problems which occur on the White River between its confluence with the Mississippi River and Lock and Dam 1. This reach of the White River serves as the entrance to the Arkansas River Navigation System. Design of the model began during November 1981 and construction was completed during September 1982. Adjustment and verification tests were completed in September 1983. Tests with additional contraction works were completed in August 1984. A sediment trap plan is currently being tested.

(3) Channel Maintenance. Maintenance dredging to maintain navigable depths amounted to approximately 1.4 million cubic yards in FY 84. Approximately 950,000 cubic yards were dredged on the Arkansas River with about 400,000 cubic yards of this being dredged by the Jadwin from the Vicksburg District Corps of Engineers. Approximately 450,000 cubic yards were dredged on the White River Entrance Channel. This was a decrease of about 100,000 cubic yards from the FY 83 dredging requirements for the River System. Dredging was performed in Pools 2, 3, 4, 7, 9, Lake Dardanelle, Ozark Lake, and the White River Entrance Channel. Dredging was performed under four contracts and by one Government dredge. Also, 10 shoals in the navigation channel were removed buy the Corps-operated Arkansas River Fleet with a dragline. Locks 3 and 9 were closed on 10 September for lock unwatering and miter gate inspection. Lock 3 was reopened on 19 September and Lock 9 was reopened on 22 September. The low stages on the White River Entrance Channel restricted navigation from the beginning of FY 84 through 25 October. The Restrictions varied from day to day and involved the draft and sizes of tows and restricted navigation to daylight hours only. The maximum draft was 7.5 feet on 3, 17, and 18 October. The maximum draft was 8 feet for 7 days and 8.5 feet for 15 days during October. Approximately 23 groundings exceeding 1 hour each occurred on the navigation system in FY 84.

e. Tulsa District. During fiscal year 1984 the original sudimentation and degradation range survey of Skiatook Lake was initiated. Resurveys of the sedimentation and degradation ranges were initiated for ELk City Lake, Kansas; Pat Mayse Lake, Texas; and Lake Texoma, Oklahoma and Texas. Completion of these surveys will be in January 1985. The detailed resurvey of John Redmond Reservoir was completed in December 1983 and installation of pole monuments was completed at Fall River and Toronto Lakes, Kansas. Reservoir Sediment Data Summaries showing the results of the last resurvey for Eufaula and Heyburn Lakes were approved by SWD and results of the last resurvey of Marion Lake was also submitted for preliminary review. The inter-agency report

presenting the Tulsa District's historical suspended sediment data was published by USGS. Suspended sediment samples were collected at 17 sites. The tapering of flood flows on the Arkansas River have been effective in reducing shoaling on the McClellan-Kerr Arkansas River Navigation System; however; 142,340 cubic yards were dredged in the three forks area.

5. NAVIGATION ACTIVITIES.

a. **Galveston District.** The Consolidated Statement of tonnage handled by ports and moving on the Gulf intracoastal waterway is shown in the following table for calendar years 1981 and 1982. (SHORT TONS)

	Ports	CALENDAR YEAR 1981	CALENDAR YEAR 1982
1.	Brownsville, Texas	2,810,018	2,200,13
2.	Port Isabel, Texas	313,036	307,856
3.	Corpus Christi, Texas	41,980,354	37,974,192
4.	Freeport, Texas	23,357,106	14,989,683
5.	Galveston, Texas	11,268,337	9,349,856
6.	Houston, Texas	100,966,741	94,649,549
7.	Texas City, Texas	27,852,242	33,370,791
8.	Sabine Pass Harbor, Texas	1,063,238	1,164,632
9.	Port Arthur, Texas	26,037,529	19,945,958
10.	Beaumont, Texas	40,358,920	33,286,791
11.	Orange, Texas	484,942	279,728
12.	Port Lavaca-Point Comfort	4,148,664	4,308,436
13.	Anahuac, Texas	25,276	159,869
14.	Moss Bluff, Texas	196,402	----
15.	Liberty, Texas	0	128,747
16.	Clear Creek & Clear Lake, Texas	0	---
17.	Double Bayou, Texas	26,136	11,843
18.	Cedar Bayou, Texas	231,485	404,816
19.	Colorado River, Texas	403,016	392,933
20.	Sweeny, Texas	660,291	726,684
21.	Palacios, Texas	100,293	54,545
22.	Dickinson, Texas	23,275	17,921

	Ports	CALENDAR YEAR 1981	CALENDAR YEAR 1982
23.	Aransas Pass, Texas	9,953	12,243
24.	Port Mansfield, Texas	115,874	1,431
25.	Harlingen, Texas	655,127	862,969
26.	Channel to Victoria, Texas	2,930,820	2,744,633
27.	Chocolate Bayou, Texas	4,301,199	3,043,107
28.	Johnson Bayou, Louisiana	638,298	437,953
29.	Rockport, Texas	210,055	---
	TOTAL	**291,168,618**	**260,827,298**

Gulf Intracostal Waterway, Texas:		
(Traffic on Waterway)		
Sec. 1 (Sabine River to Galveston)	43,092,704	38,796,688
Sec. 2 (Galveston to Corpus Christi)	22,692,629	18,975,500
Sec. 3 (Corpus Christi to Mexican Border)	2,231,646	2,066,270
TOTAL	**68,016,979**	**59,838,458**

b. <u>**Little Rock District.**</u> Projections indicate that about 9.7 million tons of commerce will be moved on the McClellan-Kerr Arkansas River Navigation System in CY 84. This represents an increase of 21 percent from the CY 83 level. Commodities moved consisted of iron and steel, chemicals and chemical fertilizers, petroleum products, coal, sand and gravel, rock, soybeans, wheat other grains, and miscellaneous commodities. Inbound movements are predicted to be increased by 20 percent and outbound movements by 8 percent.

	1983* (Tons)	**1984**** (Tons)
Inbound	1,909,423	2,300.000
Outbound	3,905,948	4,200,000
Internal	1,903,695	2,600,000
Through	298,786	600,000
Total	**8,017,852**	**9,700,000**

***Unofficial figures**

****Projected figures**

c. Tulsa District. Commerical movements in Oklahoma are about 14 percent more than in 1983. Chemical fertilizer, iron and steel showed the greatest gain while other chemicals and coal were steady, and petroleum products slumped. The inbound-outbound tonnage ratio has increased to about 1:2.4 from about 1:7 in 1977.

6. Cooperative Programs.

a. Albuquerque District. The cooperative stream gaging program with the U.S. Geological Survey covered 40 stations. Total program cost for FY 84 is shown in Table VI-1. Program cost for FY 85 will be $182,810. The following is a summary of stations by river basin:

STATION SUMMARY

Basin	Stream	Reservoir	Total
Arkansas	5	2	7
Canadian	3	1	4
Rio Grande	14	4	18
Pecos	8	3	11

Note: 6 gages are not associated with project operation.

b. Fort Worth District.

(1) National Weather Service. Funds were transferred by SWF to the NWS in the amount of $71,176 for FY 1984. Under on-going programs the Corps collects rainfall at project offices while the NWS collects all other rainfall reports and maintains weather stations, including those at Corps' projects. Rainfall summaries are transmitted to the Corps via teletype, telephone, and daily computer printed map which displays current totals for reporting stations. Supplemental and accumulative storm total printouts are provided upon request. Additional hydrometeorological information was received from the NWS via the teletype circuits and AFOS. Radar scans were obtained on a Kavouras radar acquisition access and display terminal via a direct connection to the NWS Stephenville radar site (which covers the geographic area where the majority of the District's projects are concentrated) and via commerical long-distance telephone into NWS radar sites at Galveston, Hondo, and Brownsville, Texas and into Oklahoma City, Oklahoma. Continuous updates are possible during storm periods.

(2) U.S. Geological Survey.

(a) General. The USGS performed operation and maintenance on all streamflow, lake level, and some water quality stations in cooperation with the District. In addition, they arranged for reporting of river stages during flood events, made supplemental flow measurements, and processed all published data.

(b) Funds. The Fort Worth District transferred to the USGS for the Cooperative Stream Gaging Program a total of $459,000 in FY 1984. Table VI-2 indicates the number of stations, the types of funds for each of several groups of stations and both the USGS and CE contributions toward the total station cost. Total Program Cost for FY 85 will be $657,130.

c. Galveston District.

(1) U. S. Geological Survey. Two cooperative programs are currently in existence with the USGS. One provides the operation and maintenance for stream gages and the second provides the operation and minor maintenance for Data Collection Platforms. The total program cost for FY 1984 is shown in Table VI-3. The total program cost for FY 1985 will be $172,720.

(2) National Weather Service. The cooperative program with the NWS provides for the operation and maintenance of precipitation gages and for the transmission of rainfall summaries via teletype circuits. The total program cost for FY 1984 was $5,696. The total program cost for FY 1985 will be $6,367.

d. LITTLE ROCK DISTRICT. Approximately 202 rainfall and/or river stage reporting stations were operated by the National Weather Service and the Corps of Engineers in or near the Little Rock District. Of these, 117 stations are in the Corps of Engineers/National Weather Service program. The remaining 85 stations are operated solely by the National Weather Service within or near the Little Rock District. Six of these stations are airway stations that report at 6-hour intervals. Reports from these stations are used in forecasting streamflows for floods warning and operation of reservoir projects. The stream gaging data required by the District are collected under a cooperative agreement with the USGS. During the fiscal year, 110 stations were operated of which 75 were operated cooperatively and 35 were operated by the Corps of Engineers. The FY 84 total cost for collection of streamflow and some sediment data was $510,570 of which $364,170 was transferred to USGS. Program cost for FY 84 is shown in Table VI-4. The FY 85 cooperative program cost of $528,180 of which $408,100 will be transferred to USGS.

e. Tulsa District.

(1) Stream Gaging Program. Much of the information required for water control, hydrologic investigation and design of our water resources projects results from the reporting and measurement of flow, water quality, and sediment provided by a cooperative stream gaging program with the USGS. During fiscal year 84 this cooperative program included 242 stations of which 34 were operated independently by the Corps of Engineers. The stream gaging program in the Tulsa District cost $783,190 in fiscal year 84 with $552,700 of this being transferred to the USGS for operation of stations and data publication. Table VI-5 shows a breakdown of the program by class of funds used to finance the program. The total program cost for FY 85 will be $1,196,330.

(2) **Reporting Network Program.** Real-time water control and investigation and design of our water resources projects requires the measurement and reporting of rainfall and evaporation data. These data are provided through a cooperative program with the National Weather Service. During fiscal year 84 the rainfall and evaporation program in the Tulsa District cost $117,650 through transfer of funds to the National Weather Service.

7. **Annual Flood Damages Prevented.**

(a) **Albuquerque District.** The following is a listing of damages prevented by Corps and Section 7 projects during FY 84.

Damages Prevented in Thousands of Dollars

Basin	Project	Damages Prevented
Arkansas	John Martin	0
	Pueblo	1,039
	Trinidad	0
Canadian	Conchas	0
Rio Grande	Abiquiu	55,281
	Cochiti	36,693
	Glaisteo	0
	Jemez Canyon	2,402
	Platoro	494
Pecos	Santa Rosa	7
	Sumner	0
	Two Rivers	443

b. **Fort Worth District.** Annual flood damages prevented by both Corps and Section 7 Projects are shown in the following Table.

ANNUAL FLOOD DAMAGE PREVENTED

Project	DAMAGES PREVENTED FY 84 $ x 1000	CUMULATIVE BENEFITS THRU FY 84 $ x 1000
Bardwell	0	8,660.0
Belton	0	105,983,0
Benbrook 1/	0	48,304.0
Big Fossil	0	6.268.0
Canyon	0	49,624.0
Georgetown	0	3,615.0
Granger	0	6,581.0
Grapevine 2/	0	801,008.0

ANNUAL FLOOD DAMAGE PREVENTED

Project	DAMAGES PREVENTED FY 84 $ x 1000	CUMULATIVE BENEFITS THRU FY 84 $ x 1000
Hords Creek	0	937.0
Lake O' The Pines	0	6,139.0
Lavon	0	81,704.0
Navarro Mills	0	25,577.0
O. C. Fisher	0	2,376.0
Pleasanton	0	115.0
Proctor	0	5,167.0
Sam Rayburn	4,970.0	74,533.0
San Antonio	0	44,056.0
Somerville	0	30,437.0
Stillhouse Hollow	0	20,597.0
Waco	0	58,732.0
Whitney	0	131,516.0
Wright Patman	0	13,697.0
Marshall Ford	0	178,551.0
Twin Buttes	0	418.0
Total	4,970.0	1,704,595.0

1/ Includes damages prevented by Fort Worth Floodway
2/ Includes damages prevented by Lewisville and Dallas Floodway

c. Galveston District. There were no flood damages prevented along Buffalo Bayou, by the Addicks and Barker Projects, during FY 1984. The cumulative total of flood damages prevented at the projects is $82,662,000.

d. LITTLE ROCK DISTRICT. Complete data for FY 84 are not available at this time. However, damages prevented in FY 83 are shown in the following table.

FLOOD DAMAGES PREVENTED BY RESERVOIRS AND LEVEES LITTLE ROCK DISTRICT - FY 83

	Damages Prevented $
Arkansas River Basin	
Levees	6,095,000
Reservoirs	2,293,000
White River Basin	
Levees	7,289,000
Reservoirs	44,166,000
Little River Basin	
Reservoirs	1,859,000
Total for LRD Levees and Reservoirs	61,702,000

e. **Tulsa District.** Flood damages prevented by Tulsa District lakes amounted to \$37,582,000 during fiscal year 84. The cumulative total of flood damages prevented at all lakes is \$777,029,000. The following Table is a breakdown of flood damages prevented for all lakes in the Tulsa District including the non-Corps Section 7 lakes.

FLOOD DAMAGES PREVENTED BY COMPLETE AND ESSENTIALLY COMPLETED PROJECTS - TULSA DISTRICT

ARKANSAS RIVER BASIN	FY 1984	THRU 30 SEPT 1984 CUMULATIVE
Big Hill	\$ 39,000	\$ 63,000
Birch	1,249,000	,836,000
Canton	238,000	6,713,000
Cheney	172,000	7,248,000
Copan	3,702,000	8,664,000
Council Grove	1,344,000	12,312,000
El Dorado	135,000	183,000
Elk City	1,509,000	38,038,000
Eufaula	25,000	45,283,000
Fall River	1,705,000	30,091,000
Fort Gibson	17,000	33,634,000
Fort Supply	4,000	3,064,000
Great Salt Plains	6,000	13,246,000
Heyburn	302,000	4,539,000
Hulah	4,631,000	72,503,000
Kaw 1,510,000	13,631,000	
Keystone	1,509,000	91,225,000
Marion	712,000	27,283,000
Markham Ferry	8,000	5,572,000
Norman	583,000	3,709,000
Oologah	2,562,000	46,876,000
Optima	0	7,000
Pensacola	21,000	38,866,000
John Redmond	1,968,000	57,168,000
Sanford	0	6,000
Skiatook	2,167,000	5,666,000
Tenkiller Ferry	2,000	11,928,000
Toronto	921,000	25,329,000
Wister	626,000	60,389,000
TOTAL ARKANSAS BASIN	**27,667,000**	**666,072,000**

RED RIVER BASIN	FY 1984 $	THRU 30 SEP 1984 Cumulative $
Altus	35,000	3,295,000
Arbuckle	-0-	374,000
Broken Bow	61,000	11,232,000
Clayton (Sardis)	69,000	1,326,000
Denison	985,000	58,575,000
Fort Cobb	232,000	629,000
Foss	37,000	1,272,000
Hugo	35,000	5,713,000
Lake Kemp	94,000	3,024,000
Pat Mayse	206,000	3,719,000
Mountain Park	134,000	524,000
Pine Creek	26,000	8,878,000
Waurika	8,001,000	12,396,000
TOTAL RED BASIN	**9,915,000**	**110,957,000**
GRAND TOTAL	**37,582,000**	**777,029,000**

8. **Lake Attendance**

a. **Albuequerque District.** The following is a listing of attendance for Corps and Section 7 projects in the Albuquerque District.

Project Attendance in Thousands

Project	1980	1981	1982	1983	1984
			YEAR		
Abiquiu	406.1	161.8	233.0	298.5	331.9
Cochiti	496.9	335.7	429.0	498.9	519.5
Conchas	437.5	258.6	159.0	268.6	331.9
Galisteo	2.7	3.1	3.0	5.2	5.1
Jemez Canyon	35.9	31.4	10.0	20.2	44.9
John Martin	670.2	522.9	613.0	639.5	698.9
Santa Rosa	5.1	59.7	109.0	182.6	240.8
Trinidad	279.4	351.4	450.0	121.7	164.9
Two Rivers	4.2	4.1	4.0	2.8	11.6
Pueblo	598.0	701.6	604.9	675.0	906.8
Platoro	3.6	2.6	2.5	9.8	21.5
Sumner	141.0	202.1	203.0	142.2	137.7

b. **Fort Worth District.** The following is a listing of lake attendance for both Corps and Section 7 Projects for Fiscal Years 1980 through 1984.

TOTAL PERSONS
VISITING PROJECTS

Project	1980	1981	1982	1983	1984
Aquilla	--	--	--	--	26,590
Bardwell	727,143	985,812	1,000,308	977,823	974,819
Belton	2,490,074	4,083,197	2,449,310	2,446,444	2,355,254
Benbrook	2,010,460	2,078,136	2,007,943	2,020,447	3,083,414
Canyon	1,354,714	1,790,585	1,947,624	1,993,582	2,327,006
Georgetown	---	519,048	821,270	838,583	889,405
Granger	--	195,848	284,043	319,600	256,125
Grapevine	5,419,571	5,721,424	4,231,149	4,482,409	4,932,223
Hords Creek	358,553	520,119	829,561	833,248	805,937
Lake O'The Pines	3,973,739	3,981,742	4,979,192	5,243,834	3,116,076
Lavon	2,500,569	2,887,615	2,861,682	2,897,765	3,121,115
Lewisville	4,953,097	8,997,119	6,701,115	6,683,116	6,482,032
Navarro Mills	1,127,316	1,172,009	1,203,233	1,202,752	1,370,974
O.C. Fisher	2,638,415	1,040,331	3,210,221	834,256	1,328,883
Proctor	1,005,287	2,473,397	787,569	1,687,763	916,096
Sam Rayburn	932,805	912,716	1,690,258	3,304,133	3,094,293
Somerville	2,529,426	3,170,970	3,391,749	3,159,744	2,057,820
Stillhouse	872,593	1,176,788	981,487	909,148	987,303
Town Bluff	585,068	666,254	605,069	614,215	627,886
Waco	3,386,210	4,079,208	4,198,419	4,225,481	4,683,306
Whitney	2,031,536	3,093,766	2,579,171	2,236,552	2,056,072
Wright Patman	4,521,235	4,497,648	4,652,589	4,829,095	2,220,918
Twin Buttes	Not Available	--	--	--	--
Marshall Ford	Not Available	--	--	--	--

c. **Galveston District.** N/A

d. **Little Rock District.** Lake attendance for all Little Rock District lakes by calendar year is as follows:

ATTENDANCE

	1980	1981	1982	1983	1984
All Projects	37,568,800	39,848,600	43,105,000	42,770,000	42,000,000 (EST)

e. **Tulsa District.** The following is a listing of lake attendance figures for Calender Years 1980 through 1983. Lake attendance data are not available for FY 84; however, records through August 1984 indicate that it will be equal to the 1983 attendance.

ATTENDANCE AT CORPS OF ENGINEERS PROJECT IN THOUSANDS

Lake	1980	1981	1982	1983
Great Salt Pl.	719.7	582.7	647.6	433.9
Fort Supply	720.0	517.1	832.2	789.6
Canton	3416.5	2446.1	3379.8	2822.0
Hulah	531.0	422.0	469.7	328.5
Tenkiller	3675.8	3442.1	3088.2	2133.9
Wister	941.4	969.4	786.7	881.6
Keystone	4112.7	4601.1	3050.6	3105.0
Oologah	1991.6	2529.1	2432.1	2523.7
Fort Gibson	3038.6	4403.7	4484.3	3544.3
Fall River	277.1	156.7	214.0	275.0
Toronto	312.9	226.4	220.7	187.5
Elk City	294.9	247.8	299.0	269.5
Optima	58.0	121.5	170.7	190.7
Pat Mayse	1009.4	460.5	519.2	379.0
Eufaula	4240.3	4114.5	4560.8	4059.3
Heyburn	420.0	274.3	394.2	296.1
Hugo	901.8	917.1	893.2	844.1
Lake Texoma	12078.2	12400.1	10679.6	9768.2
Waurika	404.1	517.5	761.4	818.3
Millwood	2042.3	-	-	-
John Redmond	380.2	540.0	496.1	388.0
Council Grove	449.3	422.4	454.6	512.5
Broken Bow	878.3	970.6	1033.4	967.5
Gillham	158.9	-	-	-
Marion	415.2	329.7	304.4	281.9
Pine Creek	821.5	944.1	865.7	727.1
Robert S. Kerr	1133.3	1577.6	1129.8	1025.8
WD Mayo L+D	229.0	264.0	224.6	210.5
Chouteau L+D	396.6	368.0	420.3	291.3
Newt Graham L+D	606.5	504.6	537.2	379.6
Webbers Falls	749.2	936.0	832.1	779.9
Birch	347.7	423.2	480.4	335.4
DeQueen	199.9	-	-	-
Dierks	189.6	-	-	-
Kaw	1496.7	1672.7	1483.1	1107.8
Big Hill	-	-	349.1	443.2
Sardis	-	-	-	31.7
El Dorado	-	-	-	210.6
Copan	-	-	-	8.5
DISTRICT TOTAL	**49611.2**	**48453.2**	**46494.8**	**41351.5**

9. **Water Supply Storage.**

a. **Albuquerque District.** Cochiti, Galisteo, Jemez Canyon and Two Rivers projects do not have storage allocated for water supply. The following table is a listing of those reservoirs with space allocated.

STORAGE IN THOUSANDS OF ACRE-FEET

Project	Storage Allocated	Amount Contracted	Number of Contract	WATER SUPPLIED FY 83	FY 84
Conchas	259	0	0	78.4	81.3
John Martin	345	0	0	145.2	106.6
Santa Rosa	200	0	0	84.7	38.9
Trinidad	20	0	0	22.2	38.5
Abiquiu	200	0	0	0	0

b. **Fort Worth District.** Water supply information per project is tabulated as follows:

Project	Storage Allocated (Ac-Ft)	Amount Contracted (Ac-Ft)	Number of Contract (Users)	WATER SUPPLIED FY 84 (Ac-Ft)
Aquilla Lake	33,600	33,600	1	400
B. A. Steinhagen Lake	1/	1/	1	1/
Bardwell Lake	42,800	42,800	1	2,532
Belton Lake	372,700	372,700	2	53,980
Benbrook Lake	23,708	23,708 2/		
Canyon Lake	366,400	366,400	1	58,380
Georgetown	29,200	29,200	1	552
Granger Lake	37,900	37,900	1	552
Grapevine Lake	161,250	161,250	3	43,067
Hords Creek Lake	5,780	5,780	1	196
Lake O' The Pines	250,000	250,000	1	15,500
Lavon Lake	380,000	220,000 3/	1	100,853
Lewisville Lake	436,000	436,000	2	164,730
Navarro Mills Lake	53,200	53,200	1	6,897
O. C. Fisher Lake	80,400	80,400	1	3,224
Proctor Lake	31,400	31,400	1	12,891
Sam Rayburn Reservoir	43,000	43,000	2	0
Somerville Lake	143,900	143,900	2	47,350
Stillhouse Hollow Lake	204,900	204,900	1	32,800
Waco Lake	104,100	104,100	2	28,083
Whitney Lake	50,000	50,000	1	35,000
Wright Patman Lake	91,263	91,263	1	58,700

1/ LNVA is permitted to withdraw from B.A. Steinhagen Lake not to exceed 2,000 c.f.s. This lake acts as a reregulation dam to Sam Rayburn Reservoir.

2/ Remaining 48,792 ac-ft of navigation storage is in the process of being negotiated for water supply.

3/ NTMWD has given assurances for an additional 160,000 ac-ft of storage in Lavon Lake.

c. GALVESTON DISTRICT. None.

d. LITTLE ROCK DISTRICT water supply contracts and usage in FY 83 and 84 are summarized by project in the following table.

WATER SUPPLY USAGE COMPANY

Project	Amount of Storage Allocated (AC-Ft)	Amount Contracted (AC-Ft)	Number of Contract	Amount of Water Supplied (AC-Ft) FY 83	FY 84
Beaver Lake	117,000	117,000	2	24,926	28,254
Greers Ferry Lake	1,215	1,215	3	1,636	1,586
Norfork Lake	2,400	2,400	1	2,105	2,228
Nimrod Lake	33	33	1	86	85
Dierks Lake	10,100	10,100	1	223	230
Millwood Lake	150,000	150,000	1	46,441	45,924
Gillham Lake	20,600	20,600	1	567	607
DeQueen Lake	17,900	* 0	0	0	0

*Contract to be finalized in FY 85.

e. Tulsa District. Storage allocated to water supply totals 3,693,580 acre-feet in the Tulsa District. The Corps has 2,076,580 acre-feet in 31 projects while the Section 7 projects totaled 1,617,000 acre-feet in 10 projects. The following is a project listing showing water supply storage, yield, amount contracted, number of contracts (existing and pending), and usage. The first water supply usage was initiated this fiscal year at Council Grove, El Dorado and Elk City Lakes.

WATER SUPPLY STORAGE

Corps of Engineers Projects
(October 1984)

	STORAGE ALLOCATED TO WATER SUPPLY AF	ESTIMATED YIELD MGD	AMOUNT CONTRACTED AF	NUMBER OF CONTRACTS EXISTING	PENDING	AMOUNT SUPPLIED AF FY 83	FY 84
ARKANSAS RIVER BASIN							
ARCADIA (1)	23090	11	23090	1	0	0	0
BIG HILL	25700	8.5	25700	1	0	150	0
BIRCH	7630	3	0	0	0	0	0
CANDY (1)	41460	7.7	41460	1	0	0	0
CANTON	90000 (2)	12	90000	2	0	0	0
COPAN	7500	3	5000	1	2	22	84
COUNCIL GROVE	2440	6	2440	1	0	0	570
EL DORADO	142800	22.2	142800	1	0	0	6940
ELK CITY	24300	10	24300	1	0	0	76
EUFAULA	56000	50	4630	26	1	2578	2000
FORT GIBSON	0	0	0	0	0	14095	13740
FORT SUPPLY	400	0.2	400	1	0	254	229
HEYBURN	2000 (3)	1.7	2000	3	0	1634	1823
HULAH	19800	12.4	19800	3	0	8076	7793
JOHN REDMOND	34900	24.5	34900	1	0	0	339

WATER SUPPLY STORAGE

Corps of Engineers Projects
(October 1984)

PROJECT	STORAGE ALLOCATED TO WATER SUPPLY AF	ESTIMATED YIELD MGD	AMOUNT CONTRACTED AF	NUMBER OF CONTRACTS EXISTING	PENDING	AMOUNT SUPPLIED AF FY 83	FY 84
KAW	171200	167	90800	4	0	0	0
KEYSTONE	20000	20	18000	5	1	5736	4657
MARION	38300	3	38300	1	0	400	715
OOLOGAH	342600	154	298840	9	6	43361	49810
OPTIMA	76200	4.5	0	0	0	0	0
SKIATOOK (1)	62900	14	2060	2	2	0	0
TENKILLER	25400	16	17260	36	0	6969	6860
TORONTO	400	0.1	400	2	0	73	86
WISTER	9600	6	6400	2	0	2812	3120
RED RIVER BASIN							
BROKEN BOW	152500	175	0	0	0	0	0
HUGO	47600	58	44890	3	0	6002	5032
PAT MAYSE	109600	55	109600	1	0	9900	12830
PINE CREEK	49400	84	28800	1	0	33648	33708
SARDIS	297200	140	297200	1	0	1290	0
TEXOMA (4)	72600	44.3	39956	4	1	1190	4100
WAURIKA	151400	36.2	41800	1	1	4430	5837

SECTION 7 PROJECTS
(October 1984)

PROJECT (5)	STORAGE ALLOCATED TO AF	AMOUNT WITHDRAWN AF	
		FY 83	FY 84
ARKANSAS RIVER BASIN			
CHENEY	146980	23281	23289
HUDSON	0	0	0
MEREDITH	499700	75369	75358
THUNDERBIRD	105900	9747	13329
RED RIVER BASIN			
ALTUS	122900	62134	54286
ARBUCKLE	62570	6939	7257
FORT COBB	78350	6146	6815
FOSS	243670	2358	2352
LAKE KEMP	268000	60937	124071
MOUNTAIN PARK	88950	3944	6659

(1) Under construction.
(2) Data shown is for present operations providing 90000 acre-feet of storage, including 52,000 AF of irrigation under contract.
(3) Estimated storage to be available in year 2000.
(4) Joint water supply and power provided between elevation 617.0 - 590.0.
(5) Estimated yield and contract information not available.

EXPERIMENT FORM (March 1976)
SOUTHWESTERN DIVISION

ALBUQUERQUE DISTRICT
JULY 1983 DATE OF PREPARATION
REPORTS CONTROL SYMBOL DAEN-CWE-14

TABLE VI-1
PROPOSED COOPERATIVE STREAM GAGING PROGRAM
FOR
FISCAL YEAR 1984
PART A
STATIONS IN COOPERATIVE PROGRAM WITH USGS

GROSS DOLLARS SUPPORTING PROGRAM

PROPOSED TRANSFER TO USGS FROM CORPS

CLASS OF FUNDS	NUMBER OF STATIONS	USGS AER FUNDS	GEN INVES	CONST GEN	O & M	TOTAL	TOTAL CE/USGS PROGRAM	FOR CORPS OPERATION	OTHER USGS FUNDS	TOTAL For CORPS	TOTAL STATION SUPPORT
B	1	0	$ 4,100	0	0	$ 4,100	$ 4,100	0	0	$ 4,100	$ 4,100
C	5*	$ 15,400	$ 8,310	0	0	$ 8,310	$ 23,710	0	0	$ 8,310	$ 23,710
E	34	0	0	0	$169,920	$169,920	$ 169,920	0	0	$169,920	$ 169,920
F	0	0	0	0	0	0	0	0	0	0	0
SUBTOTAL	40	$ 15,400	$ 12,410	0	$169,920	$182,330	$ 197,730	0	0	$182,330	$ 197,730

CLASS OF FUNDS:

B - Surveys

C - General Coverage

E - Operation and Maintenance

F - New Work or Construction

* 2 additional stations are partially funded

EXPERIMENT FORM (March 1976)
SOUTHWESTERN DIVISION

TABLE VI - 2
PROPOSED COOPERATIVE STREAM GAGING PROGRAM
FOR
FISCAL YEAR 1984
PART A
STATIONS IN COOPERATIVE PROGRAM WITH USGS

GALVESTON DISTRICT
15 JULY 1983 DATE OF PREPARATION
REPORTS CONTROL SYMBOL DAEN-CWE-14

GROSS DOLLARS SUPPORTING PROGRAM

PROPOSED TRANSFER TO USGS FROM CORPS

CLASS OF FUNDS	NUMBER OF STATIONS	USGS AER FUNDS	GEN INVES	CONST GEN	O & M	TOTAL	TOTAL CE/USGS PROGRAM	FOR CORPS OPERATION	OTHER USGS FUNDS	TOTAL FOR CORPS	TOTAL STATION SUPPORT
B	1*		5,270			5,270	5,270	0	0	5,270	5,270
C	2*	5,850				0	5,850	0	0	0	5,850
D	0				0	0	0	0	0	0	0
E	30			9,180	139,490	139,490	139,490	12,150	8,110	51,640	159,750
F	3					9,180	9,180	810		9,990	9,990
Subtotal	35	5,850	5,270	9,180	139,490	153,940	159,790	12,960	8,110	166,990	180,860

*Coverage for one gage is both B&C.

PART B
TOTAL STREAMFLOW DATA PROGRAM FOR CORPS OF ENGINEERS

Class OF FUNDS	Total CE/USGS PROGRAM	COST FOR CORPS OPERATION	NUMBER OF STATIONS	COST FOR COPRS STATIONS	CORPS GRAND TOTAL COST
B	5,270	0	0	0	5,270
C	5,850	0	0	0	5,850
E	139,490	12,150	0	0	159,750
F	9,180	810	0	0	9,990
TOTAL	159,790	12,960	0	0	180,860

CLASS OF FUNDS:
B - Surveys
E - Operation and Maintenance

EXPERIMENT FORM (March 1976)
SOUTHWESTERN DIVISION

FORT WORTH DISTRICT
JULY 1983 DATE OF PREPARATION
REPORTS CONTROL SYMBOL DAEN-CWE-14

TABLE VI-3
PROPOSED COOPERATIVE STREAM GAGING PROGRAM
FOR
FISCAL YEAR 1984
PART A
STATIONS IN COOPERATIVE PROGRAM WITH USGS

GROSS DOLLARS SUPPORTING PROGRAM

PROPOSED TRANSFER TO USGS FROM CORPS

CLASS OF FUNDS	NUMBER OF STATIONS	USGS AER FUNDS	GEN INVES	CONST GEN	O & M	TOTAL	TOTAL CE/USGS PROGRAM	FOR CORPS OPERATION	OTHER USGS FUNDS	TOTAL For CORPS	TOTAL STATION SUPPORT
B	3	0	13,480	0	0	13,480	13,480	260	0	13,740	13,740
C	11	8,550	0	0	0	0	8,550	1,260	0	9,810	9,180
D	0	0	0	0	0	0	0	0	0	0	0
E	87	0	0	0	459,000	459,000	459,000	19,470	41,480	478,470	519,950
F	12	0	0	63,610	0	63,610	63,610	3,300	4,920	66,910	71,830
SUBTOTAL	113*	8,550	13,480	63,610	459,000	536,090	544,640	24,290	46,400	568,930	615,330

NOTE: Total is 1 less than shown Station 08110200 has dual funding.

PART B

TOTAL STREAMFLOW DATA PROGRAM FOR COPRS OF ENGINEERS

CLASS OF FUNDS	TOTAL	COST FOR CORPS OPERATION	NUMBER OF STATION	COST FOR CORPS STATION	CORPS GRAND TOTAL COST
B	13,480	260	None	None	13,740
C	0	1,260			1,260
D	0	0			0
E	459,000	19,470			478,470
F	63,610	3,300			66,910
TOTAL	536,090	24,290			568,930

CLASS OF FUNDS:
B - Surveys
C - General Coverage
D - Advance Engineering and Design
E - Operation and Maintenance
F - New Work or Construction

EXPERIMENT FORM (March 1976)
SOUTHWESTERN DIVISION

LITTLE ROCK DISTRICT
29 JULY 1983 DATE OF PREPARATION
REPORTS CONTROL SYMBOL DAEN-CWE-14

TABLE VI-4
PROPOSED COOPERATIVE STREAM GAGING PROGRAM
FOR
FISCAL YEAR 1984
PART A
STATIONS IN COOPERATIVE PROGRAM WITH USGS

GROSS DOLLARS SUPPORTING PROGRAM

CLASS OF FUNDS	NUMBER OF STATIONS	PROPOSED TRANSFER TO USGS FROM CORPS: USGS AER FUNDS	GEN INVES	CONST GEN	O & M	TOTAL	TOTAL CE/USGS PROGRAM	FOR CORPS OPERATION	OTHER USGS FUNDS	TOTAL For CORPS	TOTAL STATION SUPPORT
B	6	0	20,520	0	0	20,520	20,520	0	0	20,520	20,520
C	5	8,380	10,920	0	900	11,820	20,200	1,800	0	13,620	13,620
E	67	2,900	0	0	331,830	331,830	334,730	73,100	52,200	404,930	457,130
	78	11,280	31,440	0	332,730	364,170	375,450	74,900	52,200	439,070	491,270

PART B

TOTAL STREAMFLOW DATA PROGRAM FOR COPRS OF ENGINEERS

CLASS OF FUNDS	TOTAL CE/USGS PROGRAM	COST FOR CORPS OPERATION	NUMBER OF STATION	COST FOR CORPS STATION	CORPS GRAND TOTAL COST
B	20,520	0	0	0	20,520
C	20,200	1,800	0	0	22,000
E	334,730	73,100	35	71,500	479,330
	374,450	74,900	35	71,500	521,850

CLASS OF FUNDS:
B - Surveys
C - General Coverage
D - Advance Engineering and Design
E - Operation and Maintenance
F - New Work or Construction

EXPERIMENT FORM (March 1976)
SOUTHWESTERN DIVISION

TULSA DISTRICT
JULY 19, 1983 DATE OF PREPAPATION
REPORTS CONTROL SYMBOL DAEN-CWE-14

TABLE VI-5
PROPOSED COOPERATIVE STREAM GAGING PROGRAM FOR FISCAL YEAR 1984

PART A
STATIONS IN COOPERATIVE PROGRAM WITH USGS

GROSS DOLLARS SUPPORTING PROGRAM

PROPOSED TRANSFER TO USGS FROM CORPS

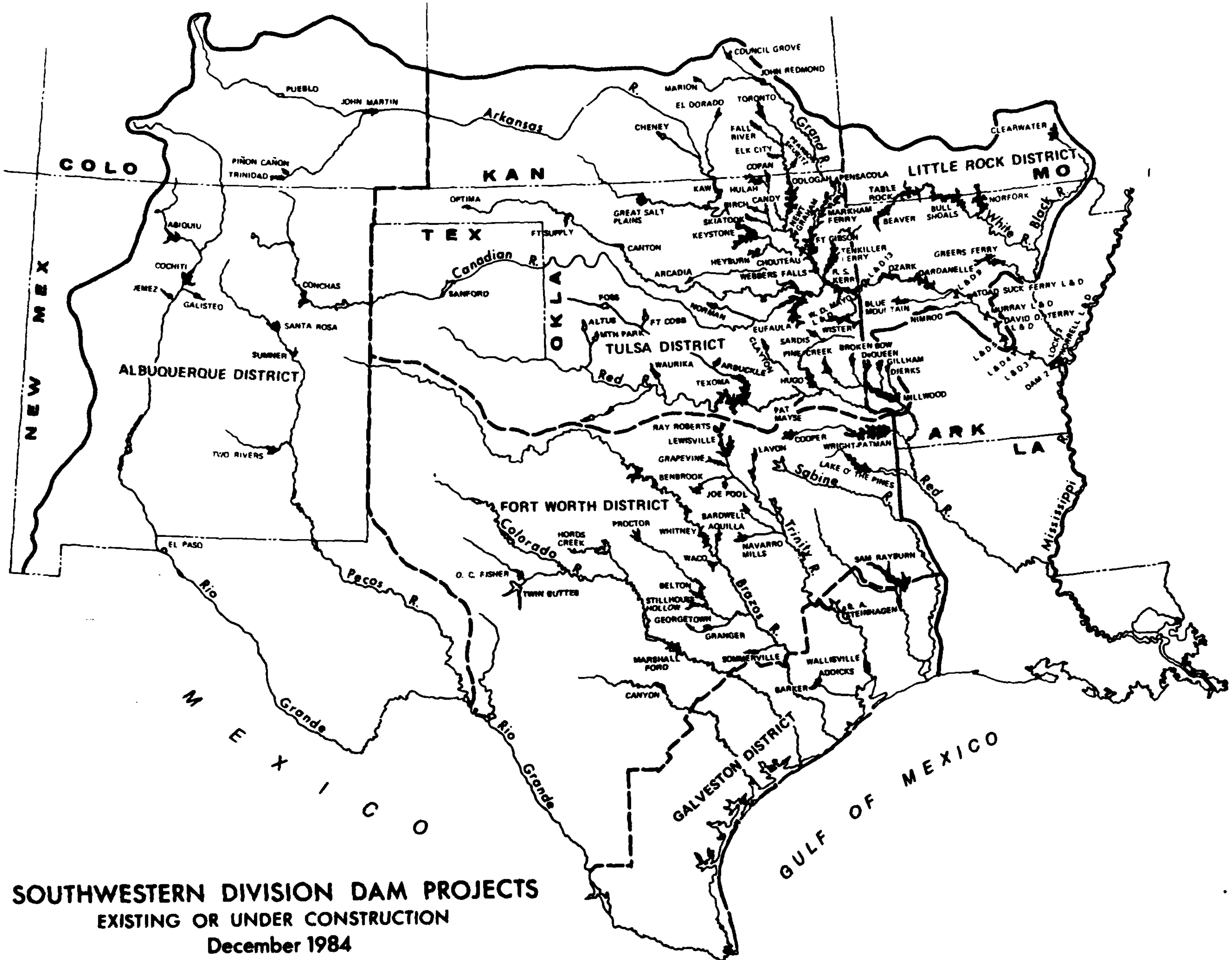
CLASS OF FUNDS	NUMBER OF STATIONS	USGS AER FUNDS	GEN INVES	CONST GEN	O & M	TOTAL	TOTAL CE/USGS PROGRAM	FOR CORPS OPERATION	OTHER USGS FUNDS	TOTAL For CORPS	TOTAL STATION SUPPORT
C	19							5,950	48,950	5,950	54,900
D											
E	216	3,800			506,040	506,040	509,840	179,300	170,020	685,340	859,160
F	5			42,860		42,860	42,860	700		43,560	43,560
TOTAL	240	3,800	0	42,860	506,040	548,900	552,700	185,950	218,970	734,850	957,620

PART B
TOTAL STREAMFLOW DATA PROGRAM FOR COPRS OF ENGINEERS

CLASS OF FUNDS	TOTAL	COST FOR CORPS OPERATION	NUMBER OF STATION	INDEPENDENT COST FOR CORPS STATION	CORPS GRAND TOTAL COST
C			0		
D		5,950	0	0	5,950
E	509,840	179,300	33	41,600	730,740
F	42,860	700	1	2,940	46,500
TOTAL	552,700	185,950	34	44,540	783,190

SECTION VII – RESERVOIR DATA SUMMARY

1. SWD MAP
2. INDEX BY BASINS
3. INDEX IN ALPHABETICAL ORDER
4. DATA TABLES



SOUTHWESTERN DIVISION DAM PROJECTS
EXISTING OR UNDER CONSTRUCTION
December 1984
(WITH SECTION 7 FLOOD CONTROL PROJECTS ADDED)

ALPHABETICAL INDEX

PROJECT NAME	RIVER BASIN	PAGE NO.
ABIQUIU	RIO GRANDE	54
ADDICKS	SAN JACINTO RIVER	44
ALTUS	RED RIVER	30
AQUILLA	BRAZOS RIVER	45
ARBUCKLE	RED RIVER	33
B A STEINHAGEN	NECHES RIVER	40
BARDWELL	TRINITY RIVER	43
BARKER	SAN JACINTO RIVER	44
BEAVER	WHITE RIVER	1
BELTON	BRAZOS RIVER	47
BENBROOK	TRINITY RIVER	41
BIG HILL	ARKANSAS RIVER	10
BIRCH	ARKANSAS RIVER	12
BLUE MOUNTAIN	ARKANSAS RIVER	24
BROKEN BOW	RED RIVER	36
BULL SHOALS	WHITE RIVER	2
CANTON	ARKANSAS RIVER	20
CANYON	GUADALUPE RIVER	53
CHENEY	ARKANSAS RIVER	5
CHOUTEAU LD 17	ARKANSAS RIVER	13
CLEARWATER	WHITE RIVER	3
COCHITI	RIO GRANDE	55
CONCHAS	ARKANSAS RIVER	18
COPAN	ARKANSAS RIVER	11
COUNCIL GROVE	ARKANSAS RIVER	14
DARDANELLE LD 10	ARKANSAS RIVER	24
DD TERRY LD 6	ARKANSAS RIVER	27
DEQUEEN	RED RIVER	37
DIERKS	RED RIVER	38
ELDORADO	ARKANSAS RIVER	6
ELK CITY	ARKANSAS RIVER	9
EUFAULA	ARKANSAS RIVER	21
FALL RIVER	ARKANSAS RIVER	9
FORT COBB	RED RIVER	32
FORT GIBSON	ARKANSAS RIVER	16
FORT SUPPLY	ARKANSAS RIVER	20
FOSS	RED RIVER	32
GALISTEO	RIO GRANDE	55
GEORGETOWN	BRAZOS RIVER	48
GILLHAM	RED RIVER	37
GRAND LAKE (PENSACOLA)	ARKANSAS RIVER	15
GRANGER	BRAZOS RIVER	48
GRAPEVINE	TRINITY RIVER	42
GREAT SALT PLAINS	ARKANSAS RIVER	7
GREERS FERRY	WHITE RIVER	3
HEYBURN	ARKANSAS RIVER	8
HORDS CR	COLORADO RIVER	51
HUGO	RED RIVER	35
HULAH	ARKANSAS RIVER	11

ALPHABETICAL INDEX

PROJECT NAME	RIVER BASIN	PAGE NO.
JEMEZ CANYON	RIO GRANDE	56
JOHN MARTIN	ARKANSAS RIVER	5
JOHN REDMOND	ARKANSAS RIVER	15
KAW	ARKANSAS RIVER	6
KEYSTONE	ARKANSAS RIVER	7
LAKE HUDSON	ARKANSAS RIVER	16
LAKE KEMP	RED RIVER	31
LAKE O THE PINES	RED RIVER	39
LAKE TEXOMA	RED RIVER	33
LAVON	TRINITY RIVER	42
LD 1	ARKANSAS RIVER	29
LD 13	ARKANSAS RIVER	23
LD 2	ARKANSAS RIVER	29
LD 3	ARKANSAS RIVER	28
LD 4	ARKANSAS RIVER	28
LD 5	ARKANSAS RIVER	27
LD 9	ARKANSAS RIVER	25
LEWISVILLE	TRINITY RIVER	41
MARION	ARKANSAS RIVER	14
MARSHALL FORD	COLORADO RIVER	52
MEREDITH (SANFORD)	ARKANSAS RIVER	18
MILLWOOD	RED RIVER	38
MURRAY LD 7	ARKANSAS RIVER	26
NAVARRO MILLS	TRINITY RIVER	43
NEWT GRAHAM LD 18	ARKANSAS RIVER	13
NIMROD	ARKANSAS RIVER	26
NORFORK	WHITE RIVER	2
O C FISHER	COLORADO RIVER	51
OOLOGAH	ARKANSAS RIVER	10
OPTIMA	ARKANSAS RIVER	19
OZARK-J T LD 12	ARKANSAS RIVER	23
PAT MAYSE	RED RIVER	34
PINE CREEK	RED RIVER	35
PLATORO	RIO GRANDE	54
PROCTOR	BRAZOS RIVER	46
PUEBLO	ARKANSAS RIVER	4
R S KERR LD 15	ARKANSAS RIVER	21
SAM RAYBURN	NECHES RIVER	40
SANTA ROSA	RIO GRANDE	56
SARDIS	RED RIVER	34
SKIATOOK	ARKANSAS RIVER	12
SOMERVILLE	BRAZOS RIVER	49
STILLHOUSE H	BRAZOS RIVER	47
SUMNER	RIO GRANDE	57
TABLE ROCK	WHITE RIVER	1
TENKILLER FERRY	ARKANSAS RIVER	17
THUNDERBIRD (NORMAN)	ARKANSAS RIVER	19
TOAD SUCK FERRY LD 8	ARKANSAS RIVER	25
TOM STEED (MTN. PARK)	RED RIVER	30

PROJECT NAME	RIVER BASIN	PAGE NO.
TORONTO	ARKANSAS RIVER	8
TRINIDAD	ARKANSAS RIVER	4
TWIN BUTTES	COLORADO RIVER	50
TWO RIVERS	RIO GRANDE	57
W D MAYO LD 14	ARKANSAS RIVER	22
WACO	BRAZOS RIVER	46
WAURIKA	RED RIVER	31
WEBBERS FALLS LD 16	ARKANSAS RIVER	17
WHITNEY	BRAZOS RIVER	45
WISTER	ARKANSAS RIVER	22
WRIGHT PATMAN	RED RIVER	39

LAKE SUMMARY TABLE INDEX

LAKE NAME	STREAM	DIST	STATE	YR COMP	POOL ELEVATION CONS	POOL ELEVATION FC	CAPACITY** 1000 AF CONS	CAPACITY** 1000 AF FC	PAGE NO
			WHITE RIVER BASIN						
BEAVER	WHITE	LRD	AR	66	1120.00	1130.00	1652	300	1
TABLE ROCK	WHITE	LRD	AR/MO	58	915.00	931.00	2702	760	1
BULL SHOALS	WHITE	LRD	AR/MO	52	654.00	695.00	3048	2360	2
NORFORK	NORTH FORK	LRD	AR/MO	45	552.00	580.00	1251	732	2
CLEARWATER	BLACK	LRD	MO	48	494.00	567.00	22	391	3
GREERS FERRY	LITTLE RED	LRD	AR	62	461.00	487.00	1119	934	3
			ARKANSAS RIVER BASIN						
PUEBLO	ARKANSAS	AD*	CO	74	4880.60	4898.70	264	93	4
TRINIDAD	PURGATORIE R	AD	CO	78	6226.40	6260.00	64	58	4
JOHN MARTIN	ARKANSAS	AD	CO	51	3851.00	3870.00	351	270	5
CHENEY	N F NINNESCAH	TD*	KS	64	1421.60	1429.00	167	81	5
ELDORADO	WALNUT	TD	KS	80	1339.00	1347.50	157	79	6
KAW	ARKANSAS	TD	OK/KS	76	1010.00	1044.50	429	919	6
GREAT SALT PLAINS	SALT FORK ARK	TD	OK	41	1125.00	1138.50	31	240	7
KEYSTONE	ARKANSAS	TD	OK	64	723.00	754.00	618	1219	7
HEYBURN	POLECAT CR	TD	OK	50	761.50	784.00	7	48	8
TORONTO	VERDIGRIS R	TD	KS	60	901.50	931.00	22	178	8
FALL RIVER	FALL	TD	DS	49	948.50	987.50	24	235	9
ELK CITY	ELK	TD	KS	66	792.00	825.00	34	256	9
BIG HILL	BIG HILL CR	TD	KS	81	858.00	867.50	27	13	10
OOLOGAH	VERDIGRIS R	TD	OK	63	638.00	661.00	553	966	10
HULAH	CANEY	TD	OK/KS	51	733.00	765.00	36	258	11
COPAN	L CANEY	TD	OK/KS	80	710.00	732.00	43	184	11
BIRCH	BRICH CREEK	TD	OK	79	750.50	774.00	19	39	12
SKIATOOK	HOMINY CREEK	TD	OK	82	714.00	729.00	305	182	12
NEWT GRAHAM LD 18	VERDIGRIS	TD	OK	70	532.00	.00	24	0	13
CHOUTEAU LD 17	VERDIGRIS	TD	OK	70	511.00	.00	23	0	13
COUNCIL GROVE	NEOSHO R	TD	KS	65	1270.00	1289.00	38	76	14
MARION	COTTONWOOD R	TD	KS	68	1350.50	1358.50	86	60	14
JOHN REDMOND	NEOSHO R	TD	KS	64	1039.00	1068.00	82	563	15
GRAND LAKE (PENSACOLA)	NEOSHO (GRAND)	TD*	OK	40	745.00	755.00	1672	525	15
LAKE HUDSON	NEOSHO (GRAND)	TD*	OK	64	619.00	636.00	200	244	16
FORT GIBSON	NEOSHO (GRAND)	TD	OK	52	544.00	582.00	365	919	16
WEBBERS FALLS LD 16	ARKANSAS	TD	OK	70	490.00	.00	165	0	17
TENKILLER FERRY	ILLINOIS R	TD	OK	52	632.00	667.00	654	577	17
CONCHAS	CANADIAN R	AD	NM	39	4201.00	4218.00	330	198	18
MEREDITH (SANFORD)	CANADIAN R	TD*	TX	65	2941.30	2965.00	945	463	18
THUNDERBIRD (NORMAN)	LITTLE R	TD*	TX	65	1039.00	1049.40	120	77	19
OPTIMA	N CANADIAN R	TD	OK	78	2763.50	2779.00	129	101	19
FORT SUPPLY	WOLF CR	TD	OK	42	2004.00	2028.00	14	87	20
CANTON	N CANADIAN R	TD	OK	48	1615.20	1638.00	116	268	20
EUFAULA	CANADIAN R	TD	OK	64	585.00	597.00	2329	1470	21
R S KERR LD 15	ARKANSAS	TD	OK	70	460.00	.00	494	0	21

LAKE SUMMARY TABLE INDEX

LAKE NAME	STREAM	DIST	STATE	YR COMP	POOL ELEVATION CONS	POOL ELEVATION FC	CAPACITY** 1000 AF CONS	CAPACITY** 1000 AF FC	PAGE NO
W D MAYO LD 14	ARKANSAS	TD	OK	70	413.00	.00	16	0	22
WISTER	POTEAU R	TD	OK	49	471.60	502.50	27	400	22
LD 13	ARKANSAS	LRD	AR/OK	69	392.00	.00	54	0	23
OZARK-J T LD 12	ARKANSAS	LRD	AR	69	372.00	.00	148	0	23
DARDANELLE LD 10	ARKANSAS	LRD	AR	64	338.00	.00	486	0	24
BLUE MOUNTAIN	PETIT JEAN	LRD	AR	47	384.00	419.00	25	233	24
LD 9	ARKANSAS	LRD	AR	69	287.00	.00	65	0	25
TOAD SUCK FERRY LD 8	ARKANSAS	LRD	AR	69	265.00	.00	35	0	25
NIMROD	FOURCHE LA FAVE	LRD	AR	42	342.00	373.00	29	307	26
MURRAY LD 7	ARKANSAS	LRD	AR	69	249.00	.00	87	0	26
DD TERRY LD 6	ARKANSAS	LRD	AR	68	231.00	.00	50	0	27
LD 5	ARKANSAS	LRD	AR	68	213.00	.00	65	0	27
LD 4	ARKANSAS	LRD	AR	68	196.00	.00	70	0	28
LD 3	ARKANSAS	LRD	AR	68	182.00	.00	46	0	28
LD 2	ARKANSAS	LRD	AR	67	162.00	.00	110	0	29
LD 1	ARKANSAS	LRD	AR	67	142.00	.00	2	0	29
				RED RIVER BASIN					
ALTUS	N F RED	TD*	OK	46	1559.00	1562.00	141	21	30
TOM STEED (MTN. PARK)	W OTTER CREEK	TD*	OK	75	1411.00	1414.00	96	20	30
LAKE KEMP	WICHITA R	TD*	TX	77	1144.00	1156.00	299	225	31
WAURIKA	BEAVER CREEK	TD	OK	78	951.40	962.50	203	140	31
FOSS	WASHITA	TD*	OK	61	1562.00	1668.60	256	181	32
FORT COBB	COBB CREEK	TD*	OK	59	1342.00	1354.80	78	64	32
ARBUCKLE	ROCK CREEK	TD*	OK	67	872.00	885.30	72	36	33
LAKE TEXOMA	RED	TD	TX/OK	45	617.30	640.00	2836	2660	33
PAT MAYSE	SANDERS CREEK	TD	TX	68	451.00	460.50	124	65	34
SARDIS	JACK FORK CREEK	TD	OK	84	599.00	607.00	302	128	34
HUGO	KIAMICHI R	TD	OK	74	404.50	437.50	157	809	35
PINE CREEK	LITTLE R	TD	OK	69	443.50	480.00	78	388	35
BROKEN BOW	MOUNTAIN FORK	TD	OK	69	599.50	627.50	919	450	36
DEQUEEN	ROLLING FORK	LRD	AR	77	437.00	473.50	35	101	37
GILLHAM	COSSATOT	LRD	AR	76	502.00	569.00	33	189	37
DIERKS	SALINE R	LRD	AR	76	526.00	557.50	30	67	38
MILLWOOD	LITTLE R	LRD	AR	66	259.20	287.00	207	1653	38
WRIGHT PATMAN	SULPHER RIVR	FWD	TX	56	220.00	259.50	143	2509	39
LAKE O THE PINES	CYPRESS CREEK	FWD	TX	60	228.50	249.50	251	580	39
				NECHES RIVER BASIN					
SAM RAYBURN	ANGELINA R	FWD	TX	65	164.40	173.00	2898	1009	40
B A STEINHAGEN	NECHES R	FWD	TX	51	81.00	83.00	70	24	40
				TRINITY RIVER BASIN					
BENBROOK	CLEAR FORK	FWD	TX	52	694.00	724.00	88	170	41
LEWISVILLE	ELM FORK	FWD	TX	54	515.00	532.00	465	525	41
GRAPEVINE	DENTON CR	FWD	TX	52	535.00	560.00	189	248	42

LAKE SUMMARY TABLE INDEX

LAKE NAME	STREAM	DIST	STATE	YR COMP	POOL ELEVATION CONS	POOL ELEVATION FC	CAPACITY** 1000 AF CONS	CAPACITY** 1000 AF FC	PAGE NO
LAVON	EAST FORK	FWD	TX	77	492.00	503.50	457	277	42
NAVARRO MILLS	RICHLAND CR	FWD	TX	68	424.50	443.00	63	149	43
BARDWELL	WAXAHACHIE CR	FWD	TX	65	421.00	439.00	55	85	43
			SAN JACINTO RIVER BASIN						
BARKER	BUFFALO BAYOU	GD	TX	45	.00	107.00	0	207	44
ADDICKS	BUFFALO BAYOU	GD	TX	48	.00	114.00	0	205	44
			BRAZOS RIVER BASIN						
WHITNEY	BRAZOS	FWD	TX	51	533.00	571.00	627	1372	45
AQUILLA	AQUILLA	FWD	TX	83	537.50	556.00	34	87	45
WACO	BOSQUE	FWD	TX	65	455.00	500.00	153	574	46
PROCTOR	LEON R	FWD	TX	63	1162.00	1197.00	59	315	46
BELTON	LEON R	FWD	TX	54	594.00	631.00	458	640	47
STILLHOUSE H	LAMPASAS R	FWD	TX	68	622.00	666.00	236	395	47
GEORGETOWN	N F SAN GABRIEL	FWD	TX	79	791.00	834.00	37	93	48
GRANGER	SAN GRBRIEL	FWD	TX	79	504.00	524.00	66	179	48
SOMERVILLE	YEGUA CR	FW	TX	67	238.00	258.00	160	347	49
			COLORADO RIVER BASIN						
TWIN BUTTES	S&M CONCHO R	FWD*	TX	63	1940.20	1969.10	186	454	50
O C FISHER	N CONCHO R	FWD	TX	52	1908.00	1938.50	119	277	51
HORDS CR	HORDS CR	FWD	TX	48	1900.00	1920.00	9	17	51
MARSHALL FORD	COLORADO R	FWD*	TX	40	681.00	714.00	1172	780	52
			GUADALUPE RIVER BASIN						
CANYON	GUADALUPE R	FWD	TX	64	909.00	943.00	386	355	53
			RIO GRANDE BASIN						
PLATORO	CONEJOS R	AD*	CO	51	10027.50	10034.00	54	6	54
ABIQUIU	RIO CHAMA	AD	NM	63	.00	6283.50	0	568	54
COCHITI	RIO GRANDE	AD	NM	75	5321.45	5460.50	47	539	55
GALISTEO	GALISTEO CR	AD	NM	70	.00	5608.00	0	90	55
JEMEZ CANYON	JEMEZ R	AD	NM	53	5160.00	5232.00	2	104	56
SANTA ROSA	PECOS R	AD	NM	80	4776.50	4797.00	267	182	56
SUMNER	PECOS R	AD*	NM	37	4261.00	4282.00	47	86	57
TWO RIVERS	RIO HONDO	AD	NM	63	.00	4032.00	0	168	57

*Section 7 Flood Control Projects
**Includes dead storage, conservation, water supply, power, irrigation, etc.

SUMMARY OF LAKE CONDITIONS FOR WATER YEAR 1984

WHITE RIVER BASIN

BEAVER LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1968 thru 1984	42.8	101.1	105.2	74.2	96.7	185.4	163.8	130.5	86.2	23.4	13.8	27.2	1,050.3
WY 1984	11.7	32.1	32.5	18.0	73.0	260.4	188.0	175.3	22.6	4.8	7.7	1.0	827.1
Releases (1,000 AC. FT.)													
Avg 1968 thru 1984	32.6	51.1	66.6	79.0	84.2	81.6	96.5	100.7	87.9	95.8	94.2	58.2	928.4
WY 1984	58.9	4.2	82.5	2.2	2.2	23.4	24.8	200.7	85.9	71.2	77.6	58.7	692.3
Basin Rainfall (inches)													
Avg 1968 thru 1984	4.2	3.9	3.1	2.0	2.3	4.0	4.0	4.8	4.2	2.6	2.7	3.8	41.6
WY 1984	4.1	5.9	2.2	0.6	4.4	6.3	4.9	7.1	1.1	2.7	2.3	5.9	47.5
Deviation	-0.1	+2.0	-0.	-1.4	+2.1	+2.3	+0.9	+2.3	-3.1	+0.1	-0.4	+2.1	+5.9
Pool Elevation													
End of Month	1,106.68	1,107.64	1,105.38	1,105.88	1,108.61	1,117.48	1,122.86	1,121.58	1,118.88	1,115.97	1,112.89	1,110.32	
Maximum	1,108.89	1,107.71	1,108.06	1,105.88	1,108.61	1,117.48	1,122.86	1,123.88	1,121.58	1,118.89	1,115.97	1,112.89	
Minimum	1,106.67	1,106.60	1,105.38	1,105.38	1,105.88	1,108.61	1,117.48	1,120.59	1,118.88	1,115.97	1,112.89	1,110.32	
Pool Content EOM (1,000 AC. FT.)	1,305.2	1,328.3	1,274.4	1,286.1	1,351.9	1,582.0	1,734.2	1,697.1	1,620.7	1,540.9	1,459.8	1,394.2	

TABLE ROCK LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1961 thru 1984	97.1	204.4	232.2	200.0	203.3	367.8	397.8	372.5	226.1	150.2	146.0	107.1	2,704.5
WY 1984	106.1	130.9	178.3	72.6	167.6	685.1	500.4	403.6	140.2	212.2	88.5	102.3	2,787.8
Releases (1,000 AC. FT.)													
Avg 1961 thru 1984	109.9	81.6	239.9	211.4	210.0	266.9	302.7	326.0	209.5	212.9	169.4	121.0	2,461.2
WY 1984	30.0	130.9	389.4	65.4	57.3	360.4	511.3	318.9	192.8	194.4	239.0	179.1	2,668.9
Intervening Basin Rainfall (inches)													
Avg 1961 thru 1984	4.4	4.0	3.2	1.8	1.7	4.0	4.3	4.5	4.6	2.9	3.3	3.8	42.5
WY 1984	5.0	5.5	2.1	0.8	3.4	5.7	4.5	4.7	1.5	3.0	1.5	5.1	42.8
Deviation	+0.6	+1.5	-1.1	-1.0	+1.7	+1.7	+0.2	+0.2	-3.1	+0.1	-1.8	+1.3	+0.3
Pool Elevation													
End of Month	911.67	911.44	905.95	905.92	908.50	916.00	915.32	916.82	915.11	912.52	908.35	907.99	
Maximum	911.68	912.38	911.44	906.43	908.50	916.86	916.43	916.82	917.14	915.51	912.52	908.35	
Minimum	910.08	911.32	905.95	905.91	905.90	908.50	914.75	915.32	914.94	912.52	908.32	907.99	
Pool Content EOM (1,000 AC. FT.)	2,561.5	2,552.0	2,333.1	2,332.0	2,433.0	2,745.0	2,715.8	2,781.1	2,706.7	2,596.8	2,427.0	2,412.6	

WHITE RIVER BASIN

BULL SHOALS LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1953 thru 1984	135.9	251.8	324.6	267.8	313.9	481.5	523.9	575.7	341.8	384.6	202.0	156.5	3,960.0
WY 1984	67.4	340.1	506.0	120.4	251.5	736.3	869.0	479.8	268.4	431.0	261.8	107.1	4,438.8
Releases (1,000 AC. FT.)													
Avg 1953 thru 1984	206.1	189.4	255.8	310.9	293.8	320.6	372.5	396.5	316.1	387.7	335.3	240.7	3,625.4
WY 1984	38.3	76.7	727.2	89.6	129.7	610.5	754.5	406.8	257.9	227.5	308.4	179.1	3,806.2
Basin Rainfall (inches)													
Avg 1953 thru 1984	3.4	4.1	3.0	1.9	1.8	3.4	4.3	4.3	3.4	3.3	3.3	4.0	40.2
WY 1984	4.7	6.5	2.4	0.8	3.4	4.9	4.3	4.3	2.1	2.9	1.6	5.3	43.2
Deviation	+1.3	+2.4	-0.6	-1.1	+1.6	+1.5	0.0	0.0	[illegible]	[illegible]	-1.7	+1.3	+3.0
Pool Elevation													
End of Month	649.98	653.90	648.59	648.99	651.45	653.86	655.84	656.86	656.49	655.65	654.06	652.02	
Maximum	[illegible]	654.08	654.96	649.14	652.21	655.03	660.13	657.97	656.93	656.54	655.74	654.06	
Minimum	[illegible]	649.98	648.59	648.57	648.98	651.06	653.84	654.91	656.31	655.23	654.06	652.02	
Pool Content EOM (1,000 AC. FT.)	[illegible]	3,043.5	2,809.4	2,826.6	2,933.8	3,041.7	3,131.7	3,179.4	[illegible]	3,123.1	3,050.8	2,959.0	

NORFORK LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1946 thru 1984	47.2	88.1	112.4	143.4	124.2	179.8	195.4	191.6	103.8	75.6	47.8	46.7	1,356.0
WY 1984	[illegible]	218.0	156.1	68.0	129.3	257.0	245.4	167.2	74.4	44.2	39.9	52.0	1,507.3
Releases (1,000 AC. FT.)													
Avg 1946 thru 1984	66.6	65.4	91.2	120.8	114.6	60.5	131.9	67.4	107.4	119.3	111.8	84.9	1,141.8
WY 1984	53.6	19.4	190.8	93.2	69.4	196.4	238.6	123.0	113.0	113.4	103.9	87.3	1,402.0
Basin Rainfall (inches)													
Avg 1946 thru 1984	2.9	4.4	3.1	2.4	2.6	3.6	4.2	4.9	4.0	3.6	3.0	3.5	42.2
WY 1984	5.4	8.5	2.9	0.7	2.8	5.1	4.1	4.2	2.2	2.0	2.5	6.1	46.5
Deviation	+2.5	+4.1	-0.2	-1.7	+0.2	+1.5	-0.1	-0.7	-1.8	-1.6	-0.5	+2.6	+4.3
Pool Elevation													
End of Month	542.31	551.67	549.84	548.4	550.96	553.82	553.66	555.14	552.89	549.14	545.53	543.36	
Maximum	543.06	551.67	553.66	549.8	551.46	553.93	554.90	555.47	555.14	552.95	549.14	545.60	
Minimum	542.26	542.26	549.76	548.24	547.80	550.84	553.25	553.45	552.88	549.14	545.53	543.14	
Pool Content EOM (1,000 AC. FT.)	1,050.8	1,243.9	1,204.4	1,174.2	1,228.3	1,291.6	1,288.0	1,321.4	1,270.8	1,189.3	1,114.6	1,071.3	

WHITE RIVER BASIN

CLEARWATER LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1949 thru 1984	20.3	41.9	59.0	54.3	54.9	88.7	95.4	77.5	34.4	26.6	18.2	20.7	591.9
WY 1984	19.6	131.9	112.7	28.4	42.8	104.3	112.1	71.0	20.8	16.5	12.7	23.0	695.8
Releases (1,000 AC. FT.)													
Avg 1949 thru 1984	22.4	32.2	53.3	53.6	56.8	76.6	88.1	76.7	50.8	32.8	26.1	25.4	584.8
WY 1984	21.2	34.9	173.0	63.9	42.8	84.5	92.6	101.6	21.2	29.8	14.1	25.0	704.6
Basin Rainfall (inches)													
Avg 1949 thru 1984	2.8	3.8	3.3	2.6	2.6	4.0	4.4	4.6	3.6	3.7	3.4	3.4	42.2
WY 1984	5.3	10.0	4.3	1.0	2.5	4.8	5.0	3.8	2.2	2.6	2.4	6.6	50.5
Deviation	+2.5	+6.2	+1.0	-1.6	-0.1	+0.8	+0.6	-0.8	-1.4	-0.7	-1.0	+3.2	+8.3
Pool Elevation													
End of Month	494.15	526.36	510.38	494.58	494.43	504.22	511.20	498.25	497.63	497.98	496.80	495.41	
Maximum	496.04	526.36	532.67	510.38	497.06	504.24	511.20	515.14	498.43	498.25	498.03	498.84	
Minimum	492.79	494.04	510.38	493.97	493.83	493.81	493.94	498.04	497.63	497.46	496.80	495.41	
Pool Content EOM (1,000 AC. FT.)	22.2	119.0	58.4	22.9	22.6	42.0	60.8	29.3	28.2	28.8	26.7	24.3	

GREERS FERRY LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1965 thru 1984	31.1	97.1	190.1	112.1	130.6	136.7	227.7	160.8	58.8	11.5	7.6	28.5	1,192.6
WY 1984	3.4	78.1	144.8	45.0	144.6	266.8	195.6	242.2	4.6	3.0	5.8	4.0	1,137.9
Releases (1,000 AC. FT.)													
Avg 1965 thru 1984	37.9	43.2	82.2	141.0	124.2	120.5	130.2	136.1	97.3	112.3	96.7	55.8	1,177.4
WY 1984	7.9	7.9	117.2	10.5	10.7	120.4	181.9	173.4	112.7	128.3	103.5	56.7	1,031.1
Basin Rainfall (inches)													
Avg 1964 thru 1984	3.6	4.4	4.7	2.8	2.8	4.9	4.8	5.3	3.8	3.4	3.1	4.9	48.5
WY 1984	2.8	6.4	4.3	1.2	3.6	5.0	4.6	6.3	0.8	2.9	3.7	5.8	47.4
Deviation	-0.8	+2.0	-0.4	-1.6	+0.8	+0.1	-0.2	+1.0	-3.0	-0.5	+0.6	+0.9	-1.1
Pool Elevation													
End of Month	448.38	450.71	451.56	452.62	456.95	461.44	461.50	463.26	459.39	456.90	453.20	451.06	
Maximum	448.78	450.71	453.02	452.62	456.95	462.00	463.49	466.29	463.26	459.39	456.90	453.20	
Minimum	448.38	448.11	450.71	451.56	452.62	456.95	461.36	461.46	459.39	456.90	453.20	451.06	
Pool Content EOM (1,000 AC. FT.)	1,537.6	1,602.9	1,626.7	1,657.0	1,785.5	1,924.4	1,926.2	1,982.3	1,860.1	1,784.0	1,673.8	1,612.7	

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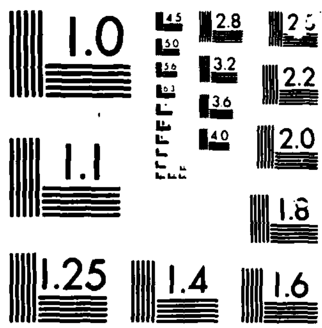

MICROCOP' CHART

ARKANSAS RIVER BASIN

PUEBLO RESERVOIR

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1000 Ac-Ft)													
Avg 1894 thru 1984	21.69	22.25	21.05	19.74	16.29	15.61	23.46	66.93	128.95	87.64	57.12	26.12	506.85
FY 1984	14.89	12.33	13.65	12.89	9.97	13.77	21.65	85.92	117.02	89.71	85.35	30.75	507.91
Releases (1000 Ac-Ft)													
Avg 1966 thru 1984	9.22	7.20	4.37	4.05	4.08	11.66	19.61	31.23	66.86	48.49	31.17	12.93	250.87
FY 1984	17.25	6.57	2.67	2.76	2.84	8.70	25.31	79.11	108.38	79.37	83.48	29.56	446.00
Rainfall (Inches)													
Avg 1938 thru 1984	.71	.42	.44	.31	.38	.74	1.22	1.65	1.27	1.90	1.82	.76	11.62
FY 1984	.05	0	0	.20	0	1.06	.69	.24	.31	1.68	4.15	.82	9.20
Pool Elevation (EOM)	4868.03	4870.55	4875.59	4879.98	4882.89	4884.31	4880.51	4880.03	4879.91	4879.91	4877.48	4875.64	
Maximum	4870.61	4870.55	4875.59	4879.98	4882.89	4884.45	4884.31	4880.03	4880.75	4880.06	4880.50	4878.27	4884.45
Minimum	4868.03	4867.70	4870.72	4875.82	4880.15	4882.99	4880.21	4875.49	4879.91	4879.45	4877.31	4875.63	4867.70
Pool Content (EOM) (1000 Ac-Ft)	210.76	220.94	242.24	262.11	275.73	282.53	265.56	262.34	261.78	261.78	250.73	242.55	

TRINIDAD LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1000 Ac-Ft)													
Avg 1977 thru 1984	2.17	1.52	1.49	1.09	1.10	1.51	3.31	11.50	15.31	10.39	10.37	5.19	64.95
FY 1984	2.11	1.77	1.49	1.45	1.57	2.36	3.49	12.97	12.24	8.19	10.91	3.80	62.34
Releases (1000 Ac-Ft)													
Avg 1978 thru 1984	2.15	.60	.31	.27	.30	.22	2.15	8.56	14.84	12.72	9.56	9.84	61.52
FY 1984	5.77	1.54	.08	.34	0	0	0	13.27	14.84	15.66	8.16	16.88	76.54
Rainfall (Inches)													
Avg 1978 thru 1984	.64	1.02	.63	.52	.63	1.51	.88	2.66	2.56	3.07	3.50	1.40	19.02
FY 1984	.25	2.09	1.01	.18	1.21	2.62	1.34	.72	2.09	2.72	3.16	.78	18.17
Pool Elevation (EOM)	6200.43	6200.46	6201.87	6203.01	6204.60	6206.86	6209.79	6208.95	6205.83	6197.34	6199.85	6183.02	
Maximum	6204.19	6200.46	6201.87	6203.01	6204.60	6206.86	6209.79	6210.13	6208.80	6205.74	6200.88	6199.45	6210.13
Minimum	6200.01	6199.71	6200.54	6201.93	6203.07	6204.66	6206.95	6208.95	6204.87	6197.24	6196.50	6183.02	6183.02
Pool Content (EOM) (1000 Ac-Ft)	37.20	37.22	38.56	39.66	41.23	43.51	46.58	45.69	42.46	34.38	36.66	23.16	

ARKANSAS RIVER BASIN

JOHN MARTIN RESERVOIR

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1000 Ac-Ft													
Avg 1943 thru 1984	7.33	6.33	6.90	7.98	7.31	7.54	7.92	16.09	48.71	37.31	29.01	9.50	191.93
FY 1984	19.01	8.79	15.41	15.22	19.52	21.04	27.61	63.03	79.92	44.09	63.22	22.31	399.18
Release (1000 Ac-Ft)													
Avg 1921 thru 1984	13.44	5.87	4.28	4.04	3.55	3.31	22.72	32.55	47.31	40.85	43.42	21.22	242.56
FY 1984	32.11	1.07	.15	.12	.13	.11	3.96	30.52	66.40	53.24	56.64	59.53	303.98
Rainfall (Inches)													
Avg 1943 thru 1984	.67	.40	.28	.23	.21	.61	1.01	2.10	1.49	1.88	1.73	.79	11.40
FY 1984	.03	.09	.17	.18	.10	1.21	1.65	1.21	.85	2.16	.09	.76	8.50
Pool Elevation (EOM)	3814.01	3815.67	3818.98	3822.00	3825.31	3828.27	3831.30	3835.07	3836.06	3834.11	3834.35	3828.68	
Maximum	3817.24	3815.67	3818.98	3822.00	3825.31	3828.27	3831.30	3835.07	3837.48	3837.27	3834.37	3834.33	3837.48
Minimum	3814.01	3814.06	3815.93	3819.06	3822.16	3825.39	3828.38	3831.29	3835.40	3834.11	3830.63	3828.68	3814.01
Pool Content (EOM) (1000 Ac-Ft)	67.54	74.55	89.41	104.51	123.32	142.02	163.05	191.58	199.46	184.10	185.97	144.74	

ARKANSAS RIVER BASIN

CHENEY RESERVOIR

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1938 THRU 1991	11.65	7.53	6.44	6.63	8.27	13.31	14.69	18.68	17.71	9.29	5.22	9.33	128.8
FY 1984	4.54	5.29	4.70	6.06	6.35	41.46	41.79	15.32	18.15	3.59	2.38	0.28	149.9
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	4.20	16.50	2.83	2.79	3.07	8.50	16.33	15.46	13.41	2.69	1.41	1.55	88.7
FY 1984	0.00	0.00	0.00	0.00	0.00	11.15	49.72	15.95	10.82	0.00	0.00	0.00	87.6
RAINFALL(INCHES)													
AVG 1930 THRU 1990	2.18	1.30	0.91	0.69	0.93	1.65	2.43	4.03	4.02	3.09	2.95	3.00	27.18
FY 1984	2.51	0.99	0.19	0.03	0.20	4.54	3.58	0.51	1.89	1.11	0.00	0.49	16.04
DEVIATION	0.33	-0.31	-0.72	-0.66	-0.73	2.89	1.15	-3.52	-2.13	-1.98	-2.95	-2.51	-11.14
POOL ELEVATION													
END OF MONTH	1419.63	1420.05	1420.29	1420.75	1421.16	1423.86	1422.54	1421.83	1421.79	1420.95	1420.05	1419.22	
MAXIMUM	1419.63	1420.05	1420.30	1420.75	1421.26	1424.63	1423.86	1422.57	1422.70	1421.78	1420.97	1420.05	
MINIMUM	1419.46	1419.63	1420.05	1420.28	1420.75	1421.16	1422.00	1421.68	1421.76	1420.95	1420.05	1419.22	
POOL CONTENT-EOM (1000AC.FT)	148.96	152.68	154.89	159.08	162.89	189.53	176.20	169.26	168.78	160.91	152.68	145.35	

ARKANSAS RIVER BASIN

ELDORADO	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1921 THRU 1979	5.00	4.40	2.80	2.70	2.80	6.20	10.20	11.80	14.40	7.40	3.40	5.50	76.6
FY 1984	0.72	0.41	0.22	1.15	1.00	43.23	40.41	14.12	12.47	0.22	0.20	0.19	114.3
RELEASES(1000AC.FT.)													
AVG 1983 THRU 1984	0.54	0.74	0.76	0.54	0.40	0.31	10.85	6.0[illegible]	8.38	1.83	[illegible].81	0.58	39.8
FY 1984	0.46	0.31	0.30	0.30	0.29	0.31	31.61	10.92	6.13	2.86	0.86	0.67	55.1
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.49	1.67	1.14	0.89	0.97	1.96	2.91	4.34	4.84	3.65	3.18	3.80	31.84
FY 1984	2.68	1.23	0.19	0.14	0.68	4.19	4.79	2.67	3.80	0.17	1.13	0.27	21.94
DEVIATION	0.19	-0.44	-0.95	-0.75	-0.29	2.23	1.88	-1.67	-1.04	-3.48	-2.05	-3.53	-9.90
POOL ELEVATION													
END OF MONTH	1328.65	1328.54	1328.38	1328.50	1328.55	1335.41	1336.31	1336.36	1336.63	1335.51	1334.70	1333.87	
MAXIMUM	1328.91	1328.70	1328.55	1328.50	1328.57	1335.41	1338.62	1336.75	1336.89	1336.63	1335.51	1334.70	
MINIMUM	1328.65	1328.50	1328.38	1328.38	1328.50	1328.55	1335.41	1336.13	1336.29	1335.51	1334.70	1333.87	
POOL CONTENT-EOM (1000AC.FT)	98.19	87.60	96.74	87.38	87.65	130.05	136.50	136.86	138.84	130.77	125.13	119.53	

ARKANSAS RIVER BASIN

KAW LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1922 THRU 1981	158.53	125.65	84.51	85.12	96.99	171.76	249.25	301.29	342.30	239.71	131.96	141.41	2128.5
FY 1984	57.32	42.64	35.13	44.43	63.47	807.17	717.82	418.81	233.16	54.05	23.11	13.29	2510.4
RELEASES(1000AC.FT.)													
AVG 1977 THRU 1984	42.56	149.96	54.67	59.15	98.36	219.53	369.36	232.03	336.24	214.73	50.24	85.96	1912.8
FY 1984	30.97	21.50	28.52	41.30	117.46	438.36	982.31	453.84	219.69	77.95	13.09	8.93	2433.9
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.39	1.66	1.13	0.87	1.03	1.88	2.86	4.29	4.44	3.50	3.17	3.58	30.80
FY 1984	3.33	1.28	0.46	0.10	0.77	4.94	3.17	2.05	2.33	0.19	0.86	0.62	20.10
DEVIATION	0.94	-0.39	-0.67	-0.77	-0.26	3.06	0.31	-2.24	-2.11	-3.31	-2.31	-2.96	-10.70
POOL ELEVATION													
END OF MONTH	1009.66	1010.74	1011.05	1011.15	1007.80	1025.43	1012.84	1010.47	1010.55	1008.45	1008.39	1008.06	
MAXIMUM	1009.97	1010.74	1011.27	1011.21	1011.30	1026.93	1025.49	1015.35	1014.80	1010.55	1008.60	1008.39	
MINIMUM	1008.30	1009.65	1010.74	1010.83	1007.45	1007.73	1012.20	1010.21	1010.23	1008.41	1008.35	1007.99	
POOL CONTENT-EOM (1000AC.FT)	422.53	441.40	446.79	448.57	392.34	753.25	479.07	436.73	438.11	402.83	401.86	396.48	

ARKANSAS RIVER BASIN

GREAT SALT PLAINS LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1981	21.23	15.25	9.13	9.23	13.13	21.07	31.69	54.65	45.26	22.56	21.24	10.10	283.5
FY 1984	11.13	9.62	6.47	7.56	9.73	67.41	94.82	30.51	23.54	2.15	1.02	0.18	264.1
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	3.34	20.60	6.21	6.00	8.96	25.67	34.20	56.57	55.13	22.24	6.05	8.68	251.6
FY 1984	6.03	8.86	7.23	6.59	7.62	49.28	101.78	31.51	17.48	2.49	0.37	0.52	239.8
RAINFALL(INCHES)													
AVG 1930 THRU 1980	1.87	1.19	0.84	0.69	0.91	1.52	2.35	3.71	3.57	2.54	2.89	2.39	24.47
FY 1984	2.67	0.53	0.04	0.06	0.39	2.76	2.38	0.64	1.08	0.23	0.39	0.13	11.30
DEVIATION	0.80	-0.66	-0.80	-0.63	-0.52	1.24	0.03	-3.07	-2.49	-2.31	-2.50	-2.26	-13.17
POOL ELEVATION													
END OF MONTH	1125.29	1125.26	1125.16	1125.26	1125.19	1126.84	1125.80	1125.34	1125.36	1124.66	1124.11	1123.45	
MAXIMUM	1125.43	1125.48	1125.33	1125.30	1125.38	1127.31	1127.49	1125.92	1125.68	1125.36	1124.66	1124.11	
MINIMUM	1124.98	1125.22	1125.16	1125.14	1125.08	1125.19	1125.73	1125.33	1125.22	1124.66	1124.11	1123.37	
POOL CONTENT-EOM (1000AC.FT)	34.11	33.83	32.90	33.83	33.18	49.50	38.84	34.57	34.76	28.65	24.17	19.32	

ARKANSAS RIVER BASIN

KEYSTONE LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1981	394.68	298.16	175.45	167.90	194.73	336.81	536.34	752.88	738.79	466.47	283.50	328.51	4664.2
FY 1984	386.28	104.13	77.75	107.90	158.99	1175.21	1637.75	676.36	351.87	135.67	32.92	15.87	4870.7
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	95.12	225.28	111.90	87.31	131.40	334.43	592.05	674.35	684.07	426.92	172.04	169.38	3784.3
FY 1984	267.47	192.19	119.50	66.69	175.54	910.47	1768.38	674.39	359.91	197.07	103.18	78.48	4913.3
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.38	1.72	1.18	0.97	1.15	1.87	2.87	4.41	4.16	3.14	2.99	3.40	30.24
FY 1984	5.30	1.16	0.12	0.04	1.15	4.52	2.34	1.32	2.71	0.26	1.38	0.38	20.68
DEVIATION	2.92	-0.56	-1.06	-0.93	0.00	2.65	-0.53	-3.09	-1.45	-2.88	-1.61	-3.02	-9.56
POOL ELEVATION													
END OF MONTH	726.90	723.23	721.36	723.10	722.69	732.05	727.51	727.15	726.39	723.11	719.37	715.41	
MAXIMUM	729.10	726.98	723.62	723.10	723.13	733.98	733.31	727.95	727.61	726.53	723.13	719.46	
MINIMUM	721.84	722.20	721.21	721.36	721.60	722.07	727.04	725.22	726.14	723.11	719.37	715.41	
POOL CONTENT-EOM (1000AC.FT)	656.87	563.14	520.11	560.01	550.42	809.40	673.75	663.73	643.15	560.25	477.55	402.53	

ARKANSAS RIVER BASIN

HEYBURN LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1929 THRU 1981	2.44	2.65	1.50	1.30	1.92	3.24	6.15	7.82	7.59	2.51	1.53	3.77	42.4
FY 1984	16.40	0.65	0.21	0.51	0.89	12.30	5.93	4.19	0.97	0.08	0.03	0.09	43.0
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1934	1.93	1.05	0.15	0.35	2.01	2.49	3.07	11.13	4.73	0.42	0.46	0.44	27.9
FY 1984	13.93	0.41	0.29	0.26	0.40	10.99	6.63	4.02	0.55	0.25	0.08	0.00	37.8
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.84	2.27	1.49	1.43	1.54	2.33	3.51	4.95	4.32	3.12	2.98	3.99	36.77
FY 1984	9.57	2.53	0.76	0.47	1.67	5.94	2.35	5.27	2.88	0.03	2.45	1.54	35.46
DEVIATION	6.73	0.26	-0.73	-0.96	0.13	3.61	-1.16	0.32	-1.44	-3.09	-0.53	-2.45	0.69
POOL ELEVATION													
END OF MONTH	761.80	761.83	761.54	761.65	761.92	762.98	762.02	761.94	761.88	760.97	761.14	760.43	
MAXIMUM	769.95	762.04	761.83	761.80	761.98	765.00	763.24	762.87	761.94	761.88	761.66	761.17	
MINIMUM	759.23	761.44	761.54	761.54	761.57	761.69	761.94	761.76	761.40	760.97	760.74	760.43	
POOL CONTENT-EOM (1000AC.FT)	6.91	6.94	6.67	6.77	7.02	8.11	7.57	7.50	7.45	6.65	6.88	6.22	

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ARKANSAS RIVER BASIN

TORONTO LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1922 THRU 1981	19.64	18.97	11.46	12.33	13.35	32.04	46.42	40.55	52.97	34.79	9.13	23.24	314.9
FY 1984	1.26	7.89	7.85	8.05	11.48	107.68	127.92	37.47	65.59	0.81	0.43	0.07	376.5
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	4.68	17.35	8.66	3.98	19.81	32.36	54.63	32.15	55.59	20.63	5.55	6.58	262.0
FY 1984	0.20	1.95	12.03	6.94	10.12	90.16	143.50	38.85	68.04	1.92	0.48	0.36	374.6
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.71	2.05	1.31	1.05	1.05	2.42	3.23	4.63	5.05	3.88	3.36	4.28	35.02
FY 1984	4.56	2.54	0.42	0.26	1.22	3.65	4.88	2.61	6.76	0.47	1.97	0.43	29.77
DEVIATION	1.85	0.49	-0.89	-0.79	0.17	1.23	1.65	-2.02	1.71	-3.41	-1.39	-3.85	-5.25
POOL ELEVATION													
END OF MONTH	900.82	902.37	901.64	902.02	902.44	907.92	902.95	902.12	902.11	901.15	900.59	899.83	
MAXIMUM	909.89	903.21	902.97	902.19	903.00	914.67	914.05	906.05	913.15	902.11	901.15	900.59	
MINIMUM	900.39	900.82	901.60	901.56	901.51	901.63	902.35	901.48	901.54	901.15	900.55	899.83	
POOL CONTENT-EOM (1000AC.FT)	19.25	25.07	21.40	22.41	23.59	41.90	25.02	22.69	22.67	20.10	18.69	16.84	

ARKANSAS RIVER BASIN

FALL RIVER LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1922 THRU 1981	15.23	14.09	8.25	9.31	10.09	23.68	36.26	33.38	37.93	18.32	6.26	15.10	227.9
FY 1984	1.42	2.76	4.05	4.07	8.32	92.23	105.47	43.30	68.45	1.59	0.72	0.10	332.5
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	2.02	8.54	4.56	2.38	12.21	24.56	42.93	31.90	48.12	27.25	4.02	3.31	211.8
FY 1984	0.21	0.18	3.82	3.00	8.99	74.37	118.04	38.97	74.84	0.98	0.36	0.27	324.0
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.61	1.76	1.23	0.95	1.04	2.17	3.11	4.45	4.86	3.69	3.10	4.03	33.00
FY 1984	4.13	2.40	0.21	0.21	1.35	4.16	4.47	2.77	6.00	0.50	1.49	0.67	28.36
DEVIATION	1.52	0.64	-1.02	-0.74	0.31	1.99	1.36	-1.68	1.14	-3.19	-1.61	-3.36	-4.64
POOL ELEVATION													
END OF MONTH	947.52	948.50	948.58	949.10	948.83	954.65	949.84	951.32	948.90	948.52	948.08	947.32	
MAXIMUM	947.69	948.50	949.04	949.45	949.64	960.00	960.27	952.00	962.84	949.09	948.52	948.08	
MINIMUM	947.04	947.50	948.46	948.53	948.52	948.51	949.57	948.60	948.67	948.52	948.08	947.32	
POOL CONTENT-EOM (1000AC.FT)	19.70	21.92	22.11	23.36	22.70	40.37	25.25	29.36	22.87	21.97	20.94	19.26	

ARKANSAS RIVER BASIN

ELK CITY LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1922 THRU 1981	18.46	17.90	8.53	10.19	9.80	25.74	41.73	40.68	42.54	21.54	5.05	14.88	257.0
FY 1984	10.21	1.68	1.18	1.57	6.87	93.08	75.44	118.04	49.03	0.44	0.38	0.28	358.2
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	1.44	10.27	5.39	6.05	12.54	25.23	37.20	33.03	50.41	61.76	4.86	3.28	251.5
FY 1984	3.86	0.71	0.74	0.74	21.27	77.39	79.62	42.97	120.76	0.80	3.77	0.96	353.6
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.81	2.22	1.35	1.23	1.17	2.33	3.45	4.71	5.10	3.63	3.15	4.33	35.48
FY 1984	4.92	1.60	0.47	0.19	1.92	4.50	4.41	4.90	5.56	0.15	1.90	1.48	32.00
DEVIATION	2.11	-0.62	-0.88	-1.04	0.75	2.17	0.96	0.19	0.46	-3.48	-1.25	-2.85	-3.48
POOL ELEVATION													
END OF MONTH	795.92	796.03	796.09	796.25	792.56	796.35	795.24	807.83	794.16	793.52	791.73	791.00	
MAXIMUM	796.61	796.03	796.19	796.25	796.25	801.61	800.08	808.95	807.83	794.17	793.52	791.73	
MINIMUM	794.32	795.73	796.02	796.09	792.01	792.17	794.12	793.93	794.12	793.52	791.73	791.00	
POOL CONTENT-EOM (1000AC.FT)	44.41	44.89	45.17	45.89	31.02	46.35	41.49	114.80	37.05	34.57	28.11	25.68	

ARKANSAS RIVER BASIN

BIG HILL	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1929 THRU 1978	1.69	1.19	0.75	1.05	0.67	1.69	2.30	3.13	3.60	1.73	0.27	1.33	19.4
FY 1984	3.14	0.64	0.21	0.24	1.63	6.81	6.43	5.83	0.45	0.06	0.16	0.12	25.7
RELEASES(1000AC.FT.)													
AVG 1984 THRU 1984	0.97	0.28	0.30	0.04	0.78	6.70	5.96	4.47	0.96	0.00	0.00	0.00	20.5
FY 1984	0.97	0.28	0.30	0.04	0.78	6.70	5.96	4.47	0.96	0.00	0.00	0.00	20.5
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.15	2.50	1.49	1.48	1.33	2.55	3.80	5.19	5.67	3.84	3.33	4.80	39.13
FY 1984	8.50	2.80	0.70	0.40	2.33	4.72	3.88	6.48	3.79	1.33	2.33	2.28	39.54
DEVIATION	5.35	0.30	-0.79	-1.08	1.00	2.17	0.08	1.29	-1.88	-2.51	-1.00	-2.52	0.41
POOL ELEVATION													
END OF MONTH	857.96	858.09	857.75	857.86	858.43	858.36	858.14	858.56	857.74	857.25	856.95	856.56	
MAXIMUM	858.92	858.20	858.14	857.85	858.66	859.95	859.39	860.72	858.54	857.74	857.25	856.95	
MINIMUM	856.38	857.73	857.75	857.72	857.82	858.06	858.10	857.83	857.74	857.25	856.93	856.54	
POOL CONTENT-EOM (1000AC.FT)	27.48	27.63	27.22	27.36	28.07	27.95	27.70	28.20	27.21	26.61	26.24	25.78	

ARKANSAS RIVER BASIN

OOLOGAH LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1981	152.90	139.22	80.40	91.90	84.20	179.83	276.30	289.73	290.68	163.74	51.80	107.14	1906.8
FY 1984	132.60	39.12	40.07	33.22	96.40	670.75	716.03	388.26	430.41	15.47	10.80	6.43	2579.6
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	27.43	95.52	39.42	26.67	86.36	196.75	307.82	205.60	258.00	278.76	37.58	35.18	1595.1
FY 1984	64.49	22.54	55.78	21.68	84.05	442.75	767.33	394.37	494.32	66.45	6.50	4.46	2424.7
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.14	2.42	1.51	1.45	1.33	2.58	3.70	5.03	5.22	3.61	3.31	4.59	37.89
FY 1984	7.06	2.29	0.43	0.31	1.67	5.27	3.90	4.33	3.59	0.42	1.85	1.37	32.49
DEVIATION	3.92	-0.13	-1.08	-1.14	0.34	2.69	0.20	-0.70	-1.63	-3.19	-1.46	-3.22	-5.40
POOL ELEVATION													
END OF MONTH	638.29	638.60	637.97	638.21	638.37	645.15	643.09	642.78	639.81	637.21	636.55	635.95	
MAXIMUM	639.87	638.73	638.63	638.30	638.80	645.15	645.31	643.48	642.78	639.81	637.21	636.60	
MINIMUM	636.02	637.65	637.82	637.93	637.87	638.04	642.74	638.77	639.81	637.21	636.55	635.95	
POOL CONTENT-EOM (1000AC.FT)	562.14	571.47	552.56	559.74	564.55	787.97	715.37	704.84	608.33	530.71	511.90	494.94	

ARKANSAS RIVER BASIN

MULAN LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1918 THRU 1991	26.93	22.70	9.62	9.63	9.35	24.64	40.30	45.44	38.01	29.02	12.01	25.62	294.1
FY 1984	26.75	3.23	5.24	3.07	13.53	134.27	88.67	34.90	16.28	0.29	0.86	0.03	328.0
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	5.40	14.68	7.77	1.58	10.25	24.20	62.96	64.96	64.97	25.00	6.55	2.60	238.9
FY 1984	18.73	1.12	3.12	2.80	6.68	77.78	144.68	30.44	20.69	0.12	0.13	0.19	306.2
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.89	2.23	1.38	1.24	1.20	2.22	3.48	4.95	4.67	3.42	3.28	4.17	35.13
FY 1984	5.83	1.14	0.18	0.10	1.68	4.45	2.17	3.10	2.60	0.02	2.01	1.26	24.54
DEVIATION	2.94	-1.09	-1.20	-1.14	0.48	2.23	-1.31	-1.85	-2.07	-3.40	-1.27	-2.91	-10.59
POOL ELEVATION													
END OF MONTH	732.82	733.10	733.41	733.14	734.59	745.25	733.98	734.81	733.08	732.25	731.60	731.11	
MAXIMUM	737.14	733.34	733.50	733.46	734.91	746.15	765.25	735.15	734.99	733.08	732.25	731.70	
MINIMUM	730.73	732.77	733.00	733.02	732.90	733.22	733.82	732.75	733.00	732.25	731.60	731.11	
POOL CONTENT-EOM (1000AC.FT)	30.49	31.48	32.62	31.63	37.09	92.69	34.72	37.94	31.41	28.52	26.36	24.78	

ARKANSAS RIVER BASIN

COPAN	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1936 THRU 1977	13.69	13.22	6.94	8.51	7.76	20.51	30.72	34.78	28.28	17.26	4.40	11.59	197.6
FY 1984	34.34	2.65	2.20	1.75	11.16	114.48	84.79	52.88	19.56	0.43	1.61	0.41	326.2
RELEASES(1000AC.FT.)													
AVG 1984 THRU 1984	24.71	2.91	2.56	1.32	6.15	72.66	113.35	35.25	41.70	0.80	0.52	0.48	302.4
FY 1984	24.71	2.91	2.56	1.32	6.15	72.66	113.35	35.25	41.70	0.80	0.52	0.48	302.4
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.04	2.28	1.39	1.33	1.23	2.41	3.51	4.83	4.96	3.44	3.14	3.90	35.46
FY 1984	7.37	1.49	0.17	0.15	1.70	5.18	3.31	4.31	2.81	0.08	2.24	1.28	30.09
DEVIATION	4.33	-0.79	-1.22	-1.18	0.47	2.77	-0.20	-0.52	-2.15	-3.36	-0.90	-2.62	-5.37
POOL ELEVATION													
END OF MONTH	709.32	709.11	709.00	709.05	709.95	716.85	711.70	714.58	710.06	709.29	708.87	708.44	
MAXIMUM	712.49	709.32	709.25	709.18	710.15	717.19	717.03	714.68	714.59	710.06	709.29	708.88	
MINIMUM	707.20	708.80	709.00	709.00	708.95	709.20	711.21	709.94	709.93	709.29	708.87	708.44	
POOL CONTENT-EOM (1000AC.FT)	40.19	39.20	38.69	38.92	43.15	83.18	52.09	68.58	43.69	40.05	38.11	36.22	

ARKANSAS RIVER BASIN

BIRCH LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1936 THRU 1979	2.49	1.65	1.02	0.96	0.96	3.02	3.18	5.61	3.12	1.78	6.82	1.95	26.5
FY 1984	4.05	0.64	0.09	0.46	1.02	13.89	5.74	11.98	0.48	0.00	0.38	0.11	38.8
RELEASES(1000AC.FT.)													
AVG 1979 THRU 1984	0.30	0.21	0.24	0.55	1.29	2.65	2.92	6.62	1.89	0.84	1.25	0.23	18.8
FY 1984	0.73	0.35	0.67	0.12	0.31	10.20	7.99	11.73	0.81	0.12	0.12	0.12	33.3
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.78	2.16	1.43	1.27	1.33	2.43	3.31	5.00	4.52	3.16	3.29	4.25	34.93
FY 1984	5.45	1.54	0.21	0.18	1.78	6.89	1.94	4.41	2.40	0.04	1.64	1.46	27.94
DEVIATION	2.67	-0.62	-1.22	-1.09	0.45	4.46	-1.37	-0.59	-2.12	-3.12	-1.65	-2.79	-6.99
POOL ELEVATION													
END OF MONTH	750.71	750.83	750.14	750.40	750.85	753.68	751.43	751.29	750.50	749.79	749.46	748.99	
MAXIMUM	751.33	751.01	750.83	750.40	750.99	754.21	753.68	756.69	751.29	750.50	749.84	749.46	
MINIMUM	747.87	750.49	750.14	750.13	750.21	750.49	750.53	750.67	750.33	749.79	749.46	748.99	
POOL CONTENT-EOM (1000AC.FT)	19.42	19.56	18.79	19.07	19.58	22.96	20.25	20.09	19.19	18.39	18.02	17.58	

ARKANSAS RIVER BASIN

SKIATOOK LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1935 THRU 1978	13.47	8.09	3.91	3.61	4.29	12.59	15.35	28.43	16.19	10.64	4.09	12.37	133.0
FY 1984	23.01	3.48	0.49	0.87	2.62	76.27	61J51	36.86	2.07	0.06	0.08	0.06	207.4
RELEASES(1000AC.FT.)													
LAKE HAS NOT FILLED													
RAINFALL(INCHES)													
AVG 1930 THRU 1990	2.88	2.21	1.41	1.32	1.36	2.37	3.30	4.83	4.38	3.24	3.25	4.19	34.74
FY 1984	5.28	1.55	0.40	0.13	1.20	6.40	2.11	2.15	2.36	0.40	2.66	1.81	26.45
DEVIATION	2.40	-0.66	-1.01	-1.19	-0.16	4.03	-1.19	-2.68	-2.02	-2.84	-0.59	-2.38	-8.29
POOL ELEVATION													
END OF MONTH	622.60	624.70	621.10	623.00	625.80	654.60	633.30	638.90	620.90	620.80	620.80	620.80	
MAXIMUM	655.30	626.00	624.70	623.10	631.00	659.90	654.60	656.00	638.90	620.90	621.30	620.80	
MINIMUM	621.40	621.30	621.10	621.00	622.80	623.00	623.00	623.20	620.90	620.80	620.80	620.80	
POOL CONTENT-EOM (1000AC.FT)	0.06	0.11	0.03	0.06	0.15	8.62	0.58	1.28	0.03	0.03	0.03	0.03	

ARKANSAS RIVER BASIN

NEWT GRAHAM LOCK AND DAM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1957	306.03	159.47	104.65	137.73	123.85	203.04	501.27	562.13	549.77	233.60	99.67	137.64	3118.9
FY 1984	250.41	84.50	112.76	59.50	165.52	1030.81	1259.11	731.60	635.90	92.88	23.50	24.20	4470.7
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	65.33	172.77	97.54	71.23	177.64	347.81	513.37	505.26	439.37	352.40	[illegible]	58.87	2863.1
FY 1984	249.72	84.95	113.17	59.94	165.81	1029.93	1257.51	736.36	632.92	94.49	23.38	23.63	4471.8
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.12	2.36	1.54	1.46	1.47	2.53	3.61	4.88	4.73	3.28	3.20	4.32	36.58
FY 1984	7.21	2.32	0.34	0.34	1.82	6.30	2.85	4.20	2.52	0.28	2.07	1.98	32.23
DEVIATION	4.09	-0.04	-1.20	-1.12	0.35	3.77	-0.76	-0.68	-2.21	-3.00	-1.13	-2.34	-4.27
POOL ELEVATION													
END OF MONTH	532.39	532.53	532.32	532.45	531.87	532.36	532.57	532.15	532.47	532.71	532.38	532.33	
MAXIMUM	532.67	532.73	532.74	532.70	532.78	532.70	532.57	532.90	532.81	532.87	532.79	532.91	
MINIMUM	531.58	532.01	532.00	531.99	531.87	531.35	531.60	530.21	531.68	531.96	531.99	531.98	
POOL CONTENT-EOM (1000AC.FT)	24.07	24.31	23.98	24.18	23.30	24.04	24.37	23.72	24.21	24.58	24.07	24.00	

ARKANSAS RIVER BASIN

CHOUTEAU LOCK AND DAM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1957	306.03	159.47	104.65	137.73	123.85	203.31	501.22	562.13	549.77	233.60	99.67	137.64	3119.1
FY 1984	258.25	79.04	91.93	50.18	151.44	1048.16	1304.43	747.28	634.02	85.78	19.73	16.56	4486.8
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	63.82	168.12	78.80	60.88	174.05	342.91	523.05	501.97	447.38	338.94	65.13	52.13	2817.2
FY 1984	257.55	79.05	91.02	48.38	151.18	1048.95	1302.53	746.87	633.46	84.28	18.90	15.33	4477.5
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.40	2.83	2.00	1.90	1.99	2.91	4.15	5.22	5.06	3.06	2.93	4.16	39.61
FY 1984	7.80	3.83	0.46	0.83	2.79	5.30	3.21	6.65	2.01	0.56	2.18	2.07	37.69
DEVIATION	4.40	1.00	-1.54	-1.07	0.80	2.39	-0.94	1.43	-3.05	-2.50	-0.75	-2.09	-1.92
POOL ELEVATION													
END OF MONTH	511.28	511.43	511.49	511.49	511.27	511.44	511.39	511.48	511.39	511.46	511.46	511.34	
MAXIMUM	511.51	511.71	511.50	511.50	511.56	511.58	511.51	511.69	511.55	511.52	511.51	511.51	
MINIMUM	511.19	511.11	511.10	511.21	511.04	510.97	511.05	511.02	511.09	511.20	511.19	511.21	
POOL CONTENT-EOM (1000AC.FT)	23.20	23.55	23.68	23.66	23.18	23.57	23.43	23.66	23.43	23.61	23.61	23.34	

ARKANSAS RIVER BASIN

COUNCIL GROVE LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1922 THRU 1981	5.97	4.43	2.97	2.79	3.75	7.35	10.32	12.52	16.44	12.31	5.02	17.52	91.4
FY 1984	0.59	7.69	1.32	5.84	3.15	36.11	41.96	10.29	11.35	3.26	0.11	0.14	121.8
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	0.68	3.12	3.78	0.89	3.89	7.89	12.31	11. 1	15.30	15.32	1.08	1.04	77.0
FY 1984	0.26	2.20	8.73	4.44	3.84	25.73	22.26	25.40	9.70	6.32	0.82	0.67	110.4
RAINFALL(INCHES)													
AVG 1930 THRU 1990	2.59	1.63	1.19	0.86	0.91	1.99	3.10	4.60	4.92	3.83	3.54	3.86	33.02
FY 1984	4.10	2.83	0.67	0.11	1.00	3.39	5.90	1.86	4.98	0.19	0.56	3.53	29.12
DEVIATION	1.51	1.20	-0.52	-0.75	0.09	1.40	2.80	-2.74	0.06	-3.64	-2.98	-0.33	-3.90
POOL ELEVATION													
END OF MONTH	1271.05	1272.75	1270.10	1270.43	1270.04	1273.21	1278.47	1274.04	1274.04	1272.48	1271.71	1271.01	
MAXIMUM	1271.13	1273.25	1272.84	1270.85	1270.43	1275.76	1278.47	1278.58	1274.53	1274.04	1272.48	1271.71	
MINIMUM	1270.98	1271.05	1270.01	1270.02	1269.99	1270.03	1273.08	1272.94	1273.13	1272.48	1271.71	1271.01	
POOL CONTENT-EOM (1000AC.FT)	39.36	44.53	36.60	37.56	36.43	45.98	64.33	48.64	48.64	43.70	41.34	39.24	

ARKANSAS RIVER BASIN

MARION LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1938 THRU 1971	3.16	1.28	1.49	1.94	2.08	3.31	5.91	8.70	10.17	7.13	1.78	4.79	51.7
FY 1984	1.84	2.24	3.47	3.00	2.54	34.97	32.51	7.43	7.90	0.12	0.21	0.20	94.4
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	0.50	3.81	1.73	0.74	2.54	4.78	9.35	7.59	6.72	9.09	0.75	0.57	48.2
FY 1984	0.44	0.18	0.06	0.06	0.06	24.98	21.63	15.47	5.97	0.86	0.56	0.49	70.8
RAINFALL(INCHES)													
AVG 1930 THRU 1990	2.50	1.57	1.07	0.80	0.96	1.88	2.75	4.45	4.68	3.82	3.26	3.73	31.47
FY 1984	4.25	1.78	0.22	0.13	0.40	4.64	4.39	0.95	4.84	0.00	0.94	0.88	23.42
DEVIATION	1.75	0.21	-0.85	-0.67	-0.56	2.76	1.64	-3.50	0.16	-3.82	-2.32	-2.85	-8.05
POOL ELEVATION													
END OF MONTH	1348.62	1343.85	1348.96	1349.36	1349.59	1350.92	1352.30	1350.67	1350.50	1349.62	1348.91	1348.28	
MAXIMUM	1348.64	1348.87	1348.96	1349.36	1349.61	1353.17	1352.30	1352.35	1351.10	1350.50	1349.64	1348.91	
MINIMUM	1348.46	1348.61	1348.85	1348.95	1349.36	1349.59	1350.65	1350.58	1350.50	1349.62	1348.91	1348.28	
POOL CONTENT-EOM (1000AC.FT)	72.53	73.88	74.50	76.85	78.22	86.35	95.38	84.80	83.74	78.40	74.22	70.67	

ARKANSAS RIVER BASIN

JOHN REDMOND DAM AND RES	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1922 THRU 1981	71.02	55.44	38.04	36.84	40.33	87.60	126.29	136.01	165.24	118.01	39.59	70.27	984.7
FY 1984	8.87	36.34	38.89	41.97	37.87	446.65	420.58	180.44	177.86	27.46	7.73	3.52	1428.2
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	10.74	49.60	30.76	16.17	51.57	90.66	174.11	153.38	171.94	143.76	21.79	22.27	936.7
FY 1984	1.72	12.84	49.27	31.11	55.82	247.89	480.58	253.59	170.73	74.22	4.42	2.38	1384.5
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.63	1.67	1.18	0.90	0.96	2.06	2.99	4.44	4.89	3.82	3.40	4.04	33.00
FY 1984	3.33	2.45	0.47	0.13	0.53	3.93	4.35	2.13	4.17	0.24	0.93	1.15	23.81
DEVIATION	0.70	0.76	-0.71	-0.77	-0.43	1.87	1.36	-2.31	-0.72	-3.58	-2.47	-2.89	-9.19
POOL ELEVATION													
END OF MONTH	1035.11	1038.04	1036.41	1037.65	1034.91	1050.75	1046.45	1039.86	1039.53	1033.02	1033.01	1032.77	
MAXIMUM	1035.11	1038.25	1038.04	1037.65	1037.74	1052.01	1052.70	1046.80	1045.46	1039.53	1033.12	1033.01	
MINIMUM	1034.12	1035.11	1036.40	1036.41	1034.91	1034.04	1045.77	1038.90	1038.70	1033.02	1032.95	1032.71	
POOL CONTENT-EOM (1000AC.FT)	40.21	62.79	49.65	59.54	38.85	221.98	156.50	79.40	76.29	27.16	27.10	25.83	

ARKANSAS RIVER BASIN

PENSACOLA LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1981	322.60	323.22	236.46	249.34	281.52	462.47	648.79	692.47	729.00	403.86	171.64	260.79	4782.2
FY 1984	359.21	333.42	268.56	228.10	283.83	1589.55	1531.64	639.07	425.85	123.17	30.45	20.23	5832.9
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	122.35	213.82	210.45	132.02	216.58	485.20	690.21	496.36	498.83	526.60	210.42	151.20	3954.0
FY 1984	109.61	267.33	440.01	150.60	186.64	1362.85	1654.85	650.18	441.69	120.00	79.74	52.52	5515.9
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.39	2.71	1.89	1.73	1.73	2.91	4.02	5.15	5.26	3.58	3.39	4.64	40.40
FY 1984	7.30	3.71	0.76	0.47	1.69	4.97	3.71	2.20	2.54	0.47	1.92	1.44	31.18
DEVIATION	3.91	1.00	-1.13	-1.26	-0.04	2.06	-0.31	-2.95	-2.72	-3.11	-1.47	-3.20	-9.22
POOL ELEVATION													
END OF MONTH	742.89	744.23	740.23	741.96	744.02	748.65	745.99	745.44	744.68	744.24	742.68	741.49	
MAXIMUM	743.19	744.31	744.23	741.96	744.02	749.31	748.65	746.06	745.44	744.76	744.28	742.73	
MINIMUM	736.97	742.65	740.21	740.23	741.96	744.02	745.99	744.21	743.80	743.91	742.68	741.49	
POOL CONTENT-EOM (1000AC.FT)	1576.16	1636.58	1461.66	1535.29	1626.92	1848.50	1718.53	1692.68	1657.28	1637.04	1566.92	1515.07	

ARKANSAS RIVER BASIN

LAKE HUDSON	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1991	365.07	326.50	276.23	277.65	316.68	493.77	703.76	798.60	797.85	469.55	232.23	292.51	5351.4
FY 1984	144.99	326.43	479.40	188.43	227.70	1615.93	1837.88	774.35	488.73	126.94	89.36	54.74	6354.9
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	132.93	244.46	236.70	150.97	268.51	555.27	854.74	589.45	629.00	560.06	214.45	155.65	4602.2
FY 1984	141.62	329.06	473.35	187.26	230.16	1538.29	1906.34	773.69	481.63	123.17	84.65	49.25	6318.5
RAINFALL(INCHES)													
AVG 1930 THRU 1990	3.79	3.02	2.17	1.94	2.08	3.16	4.26	5.47	5.21	3.23	3.42	4.66	42.40
FY 1984	6.59	4.73	0.80	0.57	2.00	6.24	2.92	4.30	1.49	0.23	2.80	1.95	34.62
DEVIATION	2.81	1.71	-1.37	-1.37	-0.08	3.08	-1.34	-1.17	-3.72	-3.00	-0.62	-2.71	-7.78
POOL ELEVATION													
END OF MONTH	619.50	619.14	619.60	619.61	619.26	625.54	619.67	619.36	619.58	619.30	619.26	619.32	
MAXIMUM	619.95	620.53	620.20	619.82	619.84	625.96	625.54	620.21	620.28	619.90	620.00	619.59	
MINIMUM	619.09	619.13	618.65	619.17	619.23	619.06	619.67	618.86	618.94	619.28	618.98	618.98	
POOL CONTENT-EOM (1000AC.FT)	205.83	201.85	206.93	207.04	203.17	279.12	207.70	204.28	206.71	203.61	203.17	203.84	

ARKANSAS RIVER BASIN

FORT GIBSON LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1980	372.65	377.51	305.41	312.54	355.69	546.77	797.48	887.79	880.74	507.86	248.96	323.89	5937.3
FY 1984	147.57	330.84	454.41	171.37	245.16	1681.59	1998.35	804.49	473.65	115.83	81.72	46.61	6551.6
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	142.45	261.94	251.15	161.32	293.11	577.65	907.26	645.17	631.76	617.95	214.80	152.75	4867.3
FY 1984	118.83	301.45	477.85	164.21	219.31	1439.98	2221.92	786.46	521.48	99.88	60.62	45.02	6457.0
RAINFALL(INCHES)													
AVG 1930 THRU 1990	3.63	2.96	2.16	1.97	2.13	3.14	4.26	5.40	5.12	3.05	3.21	4.39	41.42
FY 1984	6.39	4.24	0.42	0.35	2.56	5.85	2.75	3.48	1.57	0.40	2.40	2.42	32.83
DEVIATION	2.75	1.29	-1.74	-1.62	0.43	2.71	-1.51	-1.92	-3.55	-2.65	-0.81	-1.97	-8.59
POOL ELEVATION													
END OF MONTH	553.99	555.34	554.07	554.36	553.50	565.30	555.73	556.20	553.26	553.50	554.10	553.76	
MAXIMUM	555.32	555.58	555.34	554.54	555.70	565.38	565.30	556.74	556.20	553.92	554.54	554.17	
MINIMUM	552.61	553.39	553.39	553.48	552.97	554.64	555.57	552.85	553.04	552.78	553.11	553.48	
POOL CONTENT-EOM (1000AC.FT)	365.01	391.30	366.55	372.15	394.50	630.74	399.10	408.68	351.36	355.85	367.13	360.71	

ARKANSAS RIVER BASIN

WEBBERS FALLS L&D	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1940 THRU 1981	1163.75	1067.84	732.82	658.85	751.95	1291.80	1905.47	2350.06	1996.12	1593.36	687.71	627.23	14037.0
FY 1984	771.77	655.14	656.13	277.09	555.77	3824.13	6260.23	2466.84	1455.07	366.74	163.06	147.57	17599.5
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	337.20	732.04	477.40	349.37	651.29	1369.84	2295.76	2084.02	2000.18	1459.76	461.81	397.64	12616.3
FY 1984	768.84	633.96	658.64	279.87	544.83	3825.38	6255.42	2456.95	1459.98	353.80	171.49	125.32	17534.5
RAINFALL(INCHES)													
AVG 1930 THRU 1950	3.41	2.83	2.08	1.91	2.12	2.97	4.26	5.28	5.09	3.01	2.94	4.21	40.11
FY 1984	7.19	3.10	0.44	0.30	2.36	4.56	2.08	5.12	2.07	0.41	1.72	2.41	31.74
DEVIATION	3.78	0.27	-1.64	-1.61	0.24	1.57	-2.18	-0.16	-3.02	-[illegible].60	-1.22	-1.80	-8.37
POOL ELEVATION													
END OF MONTH	498.24	499.92	499.57	489.24	490.03	489.67	489.67	490.01	488.94	489.40	488.06	499.61	
MAXIMUM	490.10	490.41	490.16	490.05	490.20	490.36	490.04	490.35	490.55	490.08	489.94	490.14	
MINIMUM	488.22	487.01	487.85	488.00	488.01	489.40	489.18	489.39	488.21	488.58	497.77	487.70	
POOL CONTENT-EOM (1000AC.FT)	150.53	169.20	165.22	161.47	170.47	166.35	166.35	170.23	158.09	163.28	148.59	165.67	

ARKANSAS RIVER BASIN

TENKILLER LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1981	52.66	73.08	76.11	82.05	97.10	136.73	174.34	198.34	119.59	53.49	40.27	35.47	1129.2
FY 1984	13.29	18.05	21.82	15.47	28.56	224.13	173.55	117.02	35.80	9.72	19.83	8.33	685.6
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	29.56	19.03	40.16	43.33	41.63	64.50	113.91	94.70	72.06	57.32	50.75	27.80	654.8
FY 1984	10.85	2.70	7.42	5.33	4.07	84.49	227.02	106.77	64.66	40.28	54.14	23.26	631.8
RAINFALL(INCHES)													
AVG 1930 THRU 1950	3.62	3.17	2.58	2.22	2.66	3.52	4.59	5.65	4.89	3.15	3.29	4.32	43.66
FY 1984	4.02	4.09	0.65	0.13	2.13	5.36	2.46	3.68	0.97	0.14	2.91	2.87	29.41
DEVIATION	0.40	0.92	-1.93	-2.09	-0.53	1.84	-2.13	-1.97	-3.92	-3.01	-0.38	-1.45	-14.25
POOL ELEVATION													
END OF MONTH	622.84	624.03	625.19	625.95	627.85	638.36	634.16	634.51	631.86	628.85	625.54	623.89	
MAXIMUM	622.87	624.03	625.27	625.95	627.85	638.34	640.50	634.90	634.56	631.87	628.85	625.55	
MINIMUM	622.34	622.84	624.03	625.19	625.93	627.85	634.14	632.98	631.85	628.85	625.54	623.74	
POOL CONTENT-EOM (1000AC.FT)	543.39	557.15	570.60	579.42	602.25	739.42	682.13	686.98	652.26	614.55	574.66	555.52	

CON[illegible]S LAKE

ARKANSA[illegible]VER BASIN

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTA[illegible]
Inflows (1000 Ac-Ft)													
Avg 1940 thru 1984	16.21	19.66	18.21	9.87	3.65	3.50	5.07	8.30	14.91	22.57	32.97	16.20	171.1
FY 1984	1.61	.29	1.41	2.75	2.32	2.59	5.96	11.61	12.63	5.43	19.09	13.51	79.1
Releases (1000 Ac-Ft)													
Avg 1941 thru 1984	4.44	1.04	.92	.73	.87	.74	13.63	10.80	8.16	8.39	9.22	12.78	71.7
FY 1984	11.93	.09	0	0	0	3.41	10.65	10.96	8.04	12.61	8.29	15.35	81.3
Rainfall (Inches)													
Avg 1940 thru 1984	.95	.44	.42	.31	.35	.60	.85	1.39	1.49	2.43	2.42	1.42	13.0
FY 1984	1.55	.49	.61	.20	.03	1.11	.89	2.53	2.09	1.22	2.52	1.19	14.4
Pool Elevation (EOM)	4188.44	4188.03	4188.02	4188.24	4188.32	4187.77	4186.50	4185.99	4186.08	4184.07	4185.25	4184.37	
Maximum	4190.21	4188.42	4188.04	4188.24	4188.34	4188.31	4187.77	4186.47	4186.13	4186.18	4185.28	4185.36	4190.2
Minimum	4188.44	4188.03	4187.98	4188.03	4188.24	4187.77	4186.50	4185.83	4185.57	4184.07	4183.58	4184.06	4184.0
Pool Content (EOM) (1000 Ac-Ft)	226.00	223.17	223.10	224.61	225.17	221.38	212.89	209.58	210.16	197.55	204.86	199.39	

ARKANSAS RIVER BASIN

SANFORD RESERVOIR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1981	21.36	3.42	1.97	3.18	2.09	2.59	11.47	35.88	38.51	37.66	35.93	30.86	224.9
FY 1984	0.18	0.08	0.02	3.95	1.92	4.66	6.27	5.16	13.13	3.38	20.82	0.06	59.6
RELEASES(1000AC.FT.)													
LAKE HAS NOT FILLED													
RAINFALL(INCHES)													
AVG 1930 THRU 1980	1.32	0.60	0.49	0.45	0.48	0.68	1.14	2.52	2.36	2.68	2.48	1.62	16.82
FY 1984	1.63	0.41	0.55	0.13	0.12	0.77	0.83	1.55	3.03	2.18	5.31	0.90	17.41
DEVIATION	0.31	-0.19	0.06	-0.32	-0.36	0.09	-0.31	-0.97	0.67	-0.50	2.83	-0.72	0.59
POOL ELEVATION													
END OF MONTH	2903.94	2903.14	2902.39	2901.83	2901.22	2900.70	2900.19	2899.12	2899.03	2897.56	2898.31	2896.73	
MAXIMUM	2904.77	2903.94	2903.16	2902.39	2901.84	2901.22	2900.81	2900.19	2899.44	2899.03	2898.39	2898.31	
MINIMUM	2903.44	2903.14	2902.33	2901.83	2901.22	2900.65	2900.13	2899.12	2898.66	2897.56	2897.21	2896.73	
POOL CONTENT-EOM (1000AC.FT)	395.98	397.65	379.97	374.28	368.17	363.01	358.00	347.63	346.76	332.64	339.90	325.09	

ARKANSAS RIVER BASIN

NORMAN RESERVOIR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1926 THRU 1951	3.80	0.90	1.60	1.10	2.10	4.20	9.50	13.70	12.10	4.40	0.70	2.40	56.5
FY 1984	70.81	0.42	1.56	2.57	2.98	9.73	3.83	5.99	6.25	0.00	1.13	0.10	105.4
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	1.69	4.13	0.00	0.00	0.34	1.19	1.27	1.5[illegible]	3.43	1.25	0.00	0.00	14.9
FY 1984	15.25	37.20	0.00	0.00	0.00	4.14	6.17	0.00	1.01	0.00	0.00	0.00	64.6
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.89	2.07	1.51	1.32	1.54	2.23	3.48	5.50	4.35	4.90	2.60	3.48	33.87
FY 1984	12.29	1.77	0.51	0.15	0.93	3.98	1.76	2.23	5.62	0.26	2.76	1.70	33.96
DEVIATION	9.40	-0.30	-1.00	-1.17	-0.61	1.75	-1.72	-3.27	1.27	-2.64	0.16	-1.78	0.09
POOL ELEVATION													
END OF MONTH	1045.12	1039.08	1039.09	1039.20	1039.32	1039.05	1039.02	1039.37	1039.40	1038.41	1037.81	1037.01	
MAXIMUM	1047.36	1045.12	1039.15	1039.22	1039.32	1040.13	1039.85	1039.41	1039.84	1039.40	1038.41	1037.81	
MINIMUM	1037.29	1039.08	1039.07	1039.09	1039.20	1038.99	1038.98	1038.83	1039.17	1038.41	1037.81	1037.01	
POOL CONTENT-EOM (1000AC.FT)	161.31	120.09	120.15	120.82	121.55	124.78	119.72	121.86	122.04	116.06	112.50	107.86	

ARKANSAS RIVER BASIN

OPTIMA LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1939 THRU 1981	2.10	0.82	0.96	0.89	1.05	1.05	1.57	5.60	6.75	3.77	3.36	3.30	31.2
FY 1984	0.13	0.07	0.10	0.06	0.06	0.21	0.43	0.18	0.17	0.80	0.00	0.05	2.3
RELEASES(1000AC.FT.)													
LAKE HAS NOT FILLED													
RAINFALL(INCHES)													
AVG 1930 THRU 1980	1.13	0.59	0.40	0.37	0.42	0.77	1.23	2.64	2.25	2.69	2.41	1.62	16.52
FY 1984	0.85	0.38	0.44	0.09	0.19	1.04	0.87	1.63	1.88	1.52	3.33	1.25	13.47
DEVIATION	-0.28	-0.21	0.04	-0.28	-0.23	0.27	-0.36	-1.01	-0.37	-1.17	0.92	-0.37	-3.05
POOL ELEVATION													
END OF MONTH	2717.80	2717.70	2717.80	2717.70	2717.70	2717.80	2717.90	2717.55	2717.00	2716.30	2715.65	2715.05	
MAXIMUM	2718.00	2717.80	2717.80	2717.80	2717.70	2717.80	2718.05	2717.95	2717.55	2717.00	2716.30	2715.65	
MINIMUM	2717.80	2717.70	2717.70	2717.70	2717.70	2717.70	2717.80	2717.55	2717.00	2716.30	2715.65	2715.05	
POOL CONTENT-EOM (1000AC.FT)	2.98	2.91	2.98	2.91	2.91	2.98	3.04	2.81	2.45	2.05	1.73	1.45	

ARKANSAS RIVER BASIN

FORT SUPPLY LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1981	5.96	3.34	1.83	1.92	3.26	3.01	4.63	12.05	11.42	4.28	3.50	3.59	58.8
FY 1984	1.25	1.39	1.46	1.89	2.32	2.97	3.13	2.26	1.54	0.85	0.15	0.02	19.2
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	0.06	0.62	0.60	1.12	1.59	1.93	2.72	10.05	4.12	0.66	0.35	0.31	24.1
FY 1984	0.18	0.15	0.18	2.75	1.24	3.14	2.94	1.27	0.00	0.00	0.00	0.00	11.9
RAINFALL(INCHES)													
AVG 1930 THRU 1980	1.60	0.94	0.67	0.57	0.80	1.13	1.73	3.66	3.06	2.44	2.45	1.82	20.87
FY 1984	2.19	0.42	0.20	0.09	0.21	0.96	0.93	1.04	3.27	1.67	2.37	0.27	13.61
DEVIATION	0.59	-0.52	-0.47	-0.49	-0.59	-0.17	-0.80	-2.62	0.21	-0.77	-0.08	-1.55	-7.26
POOL ELEVATION													
END OF MONTH	2003.44	2003.95	2004.54	2004.03	2004.46	2004.21	2003.95	2004.06	2004.17	2003.81	2003.16	2002.30	
MAXIMUM	2003.49	2003.95	2004.54	2004.62	2004.59	2004.63	2004.38	2004.25	2004.19	2004.25	2003.81	2003.16	
MINIMUM	2003.05	2003.41	2003.95	2004.00	2004.03	2003.95	2003.84	2003.95	2003.94	2003.81	2003.16	2002.30	
POOL CONTENT-EOM (1000AC.FT)	12.88	13.80	14.94	13.95	14.78	14.30	13.80	14.01	14.22	13.55	12.37	11.06	

ARKANSAS RIVER BASIN

CANTON LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1981	18.09	5.83	3.94	4.22	5.63	8.35	13.59	34.74	36.74	27.60	9.76	11.25	179.7
FY 1984	3.71	2.62	2.10	5.26	5.69	11.46	16.26	8.33	8.43	0.81	0.76	0.11	65.6
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	3.73	3.53	4.72	2.44	1.01	3.23	10.21	4.81	13.10	6.01	5.92	4.33	63.1
FY 1984	0.37	0.36	0.37	0.37	0.44	5.14	18.23	4.23	0.60	0.60	41.82	0.43	73.0
RAINFALL(INCHES)													
AVG 1930 THRU 1980	1.46	0.91	0.60	0.54	0.71	1.13	1.64	3.37	2.80	2.56	2.49	1.79	20.00
FY 1984	2.31	0.74	0.36	0.14	0.36	1.54	1.49	1.26	2.73	1.89	2.32	0.46	15.59
DEVIATION	0.85	-0.17	-0.24	-0.40	-0.35	0.41	-0.16	-2.11	-0.07	-0.67	-0.17	-1.33	-4.41
POOL ELEVATION													
END OF MONTH	1614.35	1614.49	1614.60	1615.12	1615.53	1616.03	1615.52	1615.50	1615.72	1614.96	1608.50	1607.73	
MAXIMUM	1614.42	1614.61	1614.60	1615.12	1615.64	1616.13	1616.39	1615.62	1615.74	1615.72	1614.96	1608.50	
MINIMUM	1614.03	1614.35	1614.46	1614.69	1615.12	1615.35	1615.45	1615.30	1615.45	1614.96	1608.50	1607.73	
POOL CONTENT-EOM (1000AC.FT)	103.21	104.29	105.12	109.13	112.39	116.36	112.30	112.15	113.89	107.87	63.81	59.43	

ARKANSAS RIVER BASIN

EUFAULA LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1923 THRU 1981	332.38	246.54	202.92	218.39	262.49	353.60	526.38	766.88	603.75	252.71	144.26	212.12	4122.4
FY 1984	843.97	225.32	63.27	92.43	169.78	614.08	439.14	279.47	148.76	31.73	15.17	24.99	2948.1
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	95.29	186.57	73.68	92.76	144.86	120.04	179.22	438.15	537.60	254.16	176.90	66.64	2365.9
FY 1984	124.62	748.95	113.75	20.88	6.35	123.70	512.39	210.03	187.28	174.40	159.85	70.67	2452.9
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.15	2.45	1.89	1.64	1.98	2.72	3.85	5.54	4.42	3.03	2.80	3.90	37.37
FY 1984	7.45	2.27	0.24	0.32	1.52	3.55	2.05	3.16	3.37	0.54	2.00	2.35	28.82
DEVIATION	4.30	-0.18	-1.65	-1.32	-0.46	0.83	-1.80	-2.38	-1.05	-2.49	-0.80	-1.55	-8.55
POOL ELEVATION													
END OF MONTH	586.55	581.08	580.41	581.12	582.70	587.27	586.19	586.40	585.53	583.60	581.58	580.64	
MAXIMUM	586.61	586.55	581.08	581.12	582.70	587.27	588.03	586.48	586.47	585.56	583.60	581.60	
MINIMUM	579.02	581.04	580.39	580.41	581.12	582.70	586.14	585.49	585.52	583.60	581.58	580.59	
POOL CONTENT-EOM (1000AC.FT)	2491.68	1952.96	1893.90	1956.59	2102.44	2568.93	2453.66	2475.84	2384.77	2170.76	1976.40	1891.37	

ARKANSAS RIVER BASIN

R.S.KERR LOCK AND DAM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1943 THRU 1981	1283.00	1231.74	1064.24	964.67	1176.02	1963.52	2466.04	3141.04	2757.85	2170.09	986.93	1279.80	20484.9
FY 1984	857.06	1405.09	830.28	324.49	645.42	4108.56	7105.98	3008.13	1835.50	627.77	406.02	264.79	21419.1
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	455.98	933.99	614.91	484.99	867.48	1629.49	2624.67	2739.35	2666.56	1726.38	679.83	476.79	15900.4
FY 1984	880.51	1364.62	830.34	307.52	626.77	4107.85	7055.60	3015.74	1808.63	607.80	394.40	220.53	21221.5
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.60	3.07	2.57	2.13	2.61	3.43	4.54	5.61	4.69	3.16	3.15	4.19	42.75
FY 1984	4.40	4.11	0.90	0.54	3.21	4.45	4.27	5.21	1.37	1.67	2.21	3.89	36.23
DEVIATION	0.80	1.04	-1.67	-1.59	0.60	1.02	-0.27	-0.40	-3.32	-1.49	-0.94	-0.30	-6.52
POOL ELEVATION													
END OF MONTH	458.70	459.42	459.30	459.60	459.87	459.60	460.35	459.70	459.80	459.65	459.40	459.95	
MAXIMUM	460.12	459.95	459.89	459.94	460.07	460.54	460.45	460.57	460.25	460.80	460.10	460.29	
MINIMUM	458.70	458.45	458.31	459.05	458.95	458.93	459.00	459.22	458.95	458.89	459.30	459.40	
POOL CONTENT-EOM (1000AC.FT)	470.11	500.69	495.52	508.45	520.08	508.45	541.48	512.76	517.07	510.60	499.83	523.53	

ARKANSAS RIVER BASIN

W.D. MAYO LOCK AND DAM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1943 THRU 1981	1286.93	1308.95	1072.34	1000.13	1200.22	2018.50	2575.19	3157.14	2710.16	2122.46	974.74	1259.55	20680.3
FY 1984	903.27	1450.51	899.78	328.26	677.55	4096.66	7063.70	3144.59	1887.87	643.44	410.78	220.96	21697.4
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	503.46	958.79	670.69	537.26	908.81	1712.82	2633.96	2680.42	2741.48	1766.14	7.9.87	516.39	16360.1
FY 1984	902.91	1450.23	889.50	326.04	677.26	4096.20	7044.07	3142.94	1886.91	643.28	406.47	220.80	21686.6
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.39	3.32	2.71	2.24	2.80	3.65	4.46	5.53	4.32	3.16	2.99	4.09	42.66
FY 1984	3.80	4.53	1.12	0.58	3.53	4.02	3.10	7.26	0.81	0.72	2.06	4.23	35.76
DEVIATION	0.41	1.21	-1.59	-1.66	0.73	0.37	-1.36	1.73	-3.51	-2.44	-0.93	0.14	-6.90
POOL ELEVATION													
END OF MONTH	412.79	412.72	412.77	412.90	412.89	412.99	412.39	412.96	413.05	412.57	413.27	412.60	
MAXIMUM	413.14	413.26	413.12	413.21	413.32	413.26	413.85	413.13	413.64	413.13	413.30	413.27	
MINIMUM	412.02	412.21	412.12	412.13	412.13	411.12	411.11	411.20	411.89	412.25	412.15	412.24	
POOL CONTENT-EOM (1000AC.FT)	15.44	15.32	15.40	15.61	15.58	15.75	14.80	15.71	15.85	15.09	16.20	15.13	

ARKANSAS RIVER BASIN

WISTER LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1938 THRU 1981	18.76	50.47	65.96	67.53	93.39	126.43	132.44	134.46	60.21	21.41	9.21	17.46	797.7
FY 1984	1.05	12.13	28.56	17.79	96.79	224.33	60.79	232.76	4.96	4.63	2.58	7.54	693.9
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	13.19	9.76	74.52	39.33	70.29	112.42	66.90	117.66	100.27	28.35	6.26	4.15	635.1
FY 1984	0.69	5.49	46.85	17.67	69.96	205.94	100.02	162.26	45.16	1.29	1.21	0.96	657.5
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.43	3.56	3.15	2.71	3.16	4.00	4.65	5.87	4.08	3.55	3.28	4.16	45.60
FY 1984	2.27	4.43	1.65	1.25	3.75	4.66	1.54	7.11	0.82	2.44	1.52	3.71	35.15
DEVIATION	-1.15	0.87	-1.50	-1.46	0.59	0.66	-3.11	1.24	-3.26	-1.11	-1.76	-0.45	-10.45
POOL ELEVATION													
END OF MONTH	476.99	477.75	474.63	474.49	478.49	480.45	474.45	483.06	478.10	478.02	477.76	478.27	
MAXIMUM	477.21	478.20	478.03	475.09	478.85	491.64	490.45	487.45	483.06	478.13	478.11	478.27	
MINIMUM	476.98	476.84	474.46	474.43	474.48	475.08	474.44	474.43	478.10	477.70	477.71	477.36	
POOL CONTENT-EOM (1000AC.FT)	55.23	60.61	41.29	40.53	66.10	82.18	40.32	107.13	63.12	62.51	60.48	64.42	

ARKANSAS RIVER BASIN

LOCK AND DAM NO. 13	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1971 thru 1984	1,115.4	2,133.2	1,692.1	1,330.2	1,576.5	2,931.5	3,144.0	3,304.9	3,295.5	1,654.4	715.8	709.9	23,603.4
WY 1993	886.2	1,448.3	928.6	340.9	850.3	4,500.2	7,006.2	3,575.5	2,033.2	657.2	421.5	249.5	22,897.6
Project Rainfall (inches)													
Avg 1972 thru 1984	3.4	4.4	2.6	1.8	2.2	4.3	2.9	5.0	3.9	3.3	2.2	3.9	39.9
WY 1984	5.0	4.3	1.9	1.2	3.0	5.3	3.2	4.8	2.9	4.7	.3	7.1	45.7
Deviation	+1.6	-0.1	-0.7	-0.6	+0.8	+1.0	+0.3	-0.2	-0.1	+1.4	+0.1	+3.2	+6.7
Pool Elevation													
End of Month	393.20	392.03	392.70	392.10	391.40	389.38	391.40	390.22	391.70	391.92	391.74	391.44	
Maximum	393.20	393.28	392.97	392.94	393.18	392.24	391.40	392.05	391.94	392.14	392.32	392.38	
Minimum	391.56	392.03	391.70	391.84	391.19	388.90	388.54	389.10	390.22	391.22	391.12	390.98	
Pool Content EOM (1,000 AC. FT.)	67.7	59.3	64.0	59.8	55.1	43.1	55.1	47.7	57.1	57.4	58.6	55.4	

OZARK-JETA TAYLOR LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1972 thru 1984	1,023.9	2,307.9	1,958.3	1,392.9	4,281.5	3,304.7	3,567.3	3,661.4	3,549.9	1,748.8	755.7	738.1	28,317.4
WY 1984	1,010.5	1,712.5	1,109.3	389.1	959.0	5,159.7	8,034.6	3,876.8	2,129.3	1,607.5	397.0	264.8	25,650.1
Project Rainfall (inches)													
Avg 1973 thru 1984	3.4	4.9	3.7	2.1	2.6	4.7	3.2	5.3	4.2	3.3	2.3	3.8	43.5
WY 1984	1.9	4.9	3.4	1.2	4.5	5.1	1.9	6.6	1.2	1.7	2.6	3.2	38.2
Deviation	-1.5	0.0	-0.3	-0.9	+1.9	+0.4	-1.3	+1.3	+3.0	-1.6	+0.3	-0.6	+0.7
Pool Elevation													
End of Month	372.54	372.40	372.00	372.10	371.80	372.70	372.20	372.37	370.36	371.78	371.43	372.36	
Maximum	372.73	372.82	372.74	372.94	372.78	372.72	372.94	372.80	372.64	372.56	372.63	372.87	
Minimum	371.30	371.40	371.08	371.25	370.94	371.80	371.85	371.70	370.70	371.16	371.23	372.00	
Pool Content EOM (1,000 AC. FT.)	154.7	153.1	148.4	149.6	146.5	156.6	150.7	152.1	132.5	146.3	142.9	152.6	

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ARKANSAS RIVER BASIN

DARDANELLE LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1966 thru 1984	1,210.3	2,120.5	1,998.4	1,560.8	1,858.4	3,006.3	3,482.6	3,747.8	3,283.1	1,761.0	895.0	832.5	25,702.7
WY 1984	924.5	1,641.0	1,266.5	460.2	1,194.7	4,894.3	7,445.1	3,946.4	1,984.9	601.6	388.8	268.3	25,016.3
Project Rainfall (inches)													
Avg 1971 thru 1984	3.8	4.9	4.9	2.5	2.9	5.1	4.0	5.9	4.4	2.4	2.9	3.7	47.4
WY 1984	2.4	6.5	4.9	1.1	4.1	4.4	2.2	5.9	.04	3.4	3.3	3.2	41.4
Deviation	-1.4	+1.6	0.0	-1.4	+1.2	-0.7	-1.8	0.0	-4.4	+1.0	+0.4	-0.5	-7.0
Pool Elevation													
End of Month	338.19	338.27	337.91	338.46	338.25	338.40	338.08	338.33	337.88	337.81	337.63	337.62	
Maximum	388.22	338.46	338.56	338.56	338.46	338.52	338.50	338.53	337.29	338.27	338.43	338.03	
Minimum	337.17	337.37	337.05	337.90	337.19	337.93	337.90	337.01	337.79	337.06	337.47	337.02	
Pool Content EOM (1,000 AC. FT.)	492.9	495.7	483.2	502.4	495.0	500.3	489.0	497.8	479.2	480.5	473.8	473.5	

BLUE MOUNTAIN LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1948 thru 1984	6.4	20.1	33.4	43.2	44.4	64.1	55.1	57.3	16.4	10.9	5.2	5.1	361.6
WY 1984	0.5	3.5	20.5	9.1	52.7	89.9	32.9	60.5	1.2	1.3	0.6	2.7	275.4
Releases (1,000 AC. FT.)													
Avg 1948 thru 1984	5.2	12.7	31.7	35.4	41.1	49.1	44.1	52.3	36.9	18.4	11.9	6.7	335.6
WY 1984	0.6	2.2	21.1	9.2	36.8	70.7	57.9	42.9	16.9	1.3	3.5	2.7	265.8
Basin Rainfall (inches)													
Avg 1948 thru 1984	3.2	3.4	3.4	2.6	2.9	4.0	4.2	5.4	3.5	4.1	3.3	3.6	43.6
WY 1984	2.3	4.9	3.6	1.5	4.3	5.5	2.2	6.9	1.6	3.9	3.1	5.9	45.7
Deviation	-0.9	+1.5	+0.2	-1.1	+1.4	+1.5	-2.0	+1.5	-1.9	-0.2	-0.2	+2.3	+2.1
Pool Elevation													
End of Month	384.04	384.41	384.13	384.03	385.88	391.63	386.71	391.17	386.51	386.55	385.72	384.68	
Maximum	384.23	384.66	386.62	384.27	390.23	393.74	393.40	397.53	391.17	386.78	386.25	384.97	
Minimum	384.04	383.94	384.03	384.02	384.02	387.02	385.94	386.71	386.51	386.23	384.97	384.51	
Pool Content EOM (1,000 AC. FT.)	24.8	25.9	25.0	24.7	40.2	58.9	33.1	49.5	32.5	31.5	27.6	26.7	

ARKANSAS RIVER BASIN

LOCK AND DAM NO. 9	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1970 thru 1984	1,244.9	2,361.3	2,597.5	1,619.1	1,819.7	3,294.5	3,714.3	3,871.3	3,529.8	1,685.2	780.4	823.2	27,341.6
WY 1984	914.2	1,627.0	1,447.5	508.0	1,316.3	5,106.4	7,502.5	4,259.3	2,281.3	756.2	536.2	388.6	26,643.5
Project Rainfall (inches)													
Avg 1971 thru 1984	3.4	4.5	4.7	2.5	2.7	4.5	3.9	5.1	4.3	2.6	2.9	3.7	44.8
WY 1984	2.6	5.2	5.7	0.9	4.7	5.2	2.3	5.3	0.0	2.9	4.0	2.8	41.6
Deviation	-0.8	+0.7	+1.0	-1.6	+2.0	+0.7	-1.6	+0.2	-4.3	+0.3	-1.1	-0.9	-3.2
Pool Elevation													
End of Month	286.25	285.61	285.52	286.94	286.26	285.84	285.14	284.61	286.58	287.72	286.45	285.50	
Maximum	287.72	288.14	287.85	288.00	287.82	286.70	285.84	287.30	287.97	288.00	287.72	286.90	
Minimum	284.22	285.10	284.79	284.50	285.07	284.31	281.22	282.10	284.25	285.36	284.65	284.04	
Pool Content EOM (1,000 AC. FT.)	60.5	57.1	56.6	64.3	60.5	58.3	54.6	51.9	62.3	68.8	61.6	56.5	

TOAD SUCK FERRY LOCK AND DAM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1970 thru 1984	1,173.9	2,394.1	2,321.3	1,794.9	1,997.5	3,599.9	3,913.0	4,024.2	3,599.9	2,235.1	785.1	836.3	28,675.2
WY 1984	864.8	1,643.5	1,583.8	592.2	1,478.1	5,165.1	7,739.9	4,291.1	2,154.5	773.3	506.6	360.5	27,153.4
Project Rainfall (inches)													
Avg 1971 thru 1984	3.4	5.0	4.7	2.7	3.0	4.7	4.2	5.4	4.7	2.4	2.4	3.6	46.2
WY 1984	2.2	5.2	6.8	1.6	5.9	4.7	3.1	6.5	0.0	4.5	2.4	2.9	45.8
Deviation	-1.2	+0.2	+2.1	-1.1	+2.9	0.0	-1.1	+1.1	-4.7	+2.1	0.0	-0.7	-0.4
Pool Elevation													
End of Month	265.38	265.20	265.20	265.29	265.20	269.06	264.90	264.80	264.84	265.40	265.38	265.38	
Maximum	265.64	265.55	265.52	265.61	265.85	269.06	269.68	268.22	265.55	265.54	265.50	265.64	
Minimum	264.30	264.84	264.62	264.80	264.29	264.02	264.00	264.32	264.42	264.80	264.90	264.75	
Pool Content EOM (1,000 AC. FT.)	34.6	33.9	33.9	34.2	33.9	59.4	32.6	32.2	32.4	34.7	34.6	34.6	

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ARKANSAS RIVER BASIN

NIMROD LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1944 thru 1984	10.6	34.1	66.5	66.5	86.0	102.4	89.1	99.2	35.4	13.4	6.0	7.3	616.5
WY 1984	0.1	11.5	83.3	23.1	105.3	150.8	50.2	115.3	2.4	2.8	1.0	1.5	547.3
Releases (1,000 AC. FT.)													
Avg 1944 thru 1984	8.5	24.1	59.9	64.2	76.5	99.3	90.9	96.2	50.7	25.1	10.9	9.6	615.9
WY 1984	0.2	7.9	84.5	21.9	78.9	126.9	86.3	90.9	24.9	4.6	3.6	2.7	533.3
Basin Rainfall (inches)													
Avg 1944 thru 1984	3.4	3.6	3.8	3.1	3.5	4.9	4.7	5.9	4.0	4.1	3.1	3.7	47.8
WY 1984	3.4	5.4	4.8	1.4	4.9	5.4	2.3	8.1	1.2	4.5	4.1	5.5	51.0
Deviation	0.0	+1.8	+1.0	-1.7	+1.4	+0.5	-2.4	+2.2	-2.8	+0.4	+1.0	+1.8	+3.2
Pool Elevation													
End of Month	341.69	342.62	342.19	342.43	347.96	351.63	345.17	349.31	344.70	343.87	342.92	342.29	
Maximum	342.16	343.38	350.42	342.49	350.44	351.63	352.13	357.50	349.31	344.70	343.97	342.96	
Minimum	341.69	341.60	341.90	342.01	341.97	345.04	344.94	345.17	344.70	343.87	342.92	342.29	
Pool Content EOM (1,000 AC. FT.)	27.9	31.2	29.7	30.5	56.3	79.5	41.9	64.2	39.7	36.2	32.3	30.0	

MURRAY LOCK AND DAM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1970 thru 1984	1,303.1	2,417.6	2,612.4	1,882.3	2,113.9	3,758.7	4,127.7	4,403.1	3,721.5	1,703.7	757.1	831.7	29,632.8
WY 1984	874.9	1,643.4	1,659.1	523.7	1,617.9	5,564.8	8,130.6	4,548.9	2,050.3	589.3	364.9	275.3	27,843.1
Project Rainfall (inches)													
Avg 1970 thru 1984	3.8	4.9	4.4	3.0	2.8	4.3	5.1	6.0	3.8	2.6	2.5	3.6	46.8
WY 1984	3.5	3.9	6.5	1.4	3.8	5.3	1.3	8.5	.9	2.9	1.9	4.1	44.0
Deviation	-0.3	-1.0	+2.1	-1.6	+1.0	+1.0	-3.8	+2.5	-2.9	+0.3	-0.6	+0.5	-2.8
Pool Elevation													
End of Month	249.34	248.88	249.60	250.09	248.90	247.42	249.52	248.40	250.34	249.63	249.52	249.72	
Maximum	250.50	249.99	249.88	250.30	250.30	248.98	249.52	250.56	250.57	250.56	249.89	249.79	
Minimum	248.78	248.76	248.78	249.60	248.70	247.07	247.00	247.70	248.40	249.52	249.39	249.36	
Pool Content EOM (1,000 AC. FT.)	90.6	86.0	93.3	98.4	86.2	73.1	92.5	81.6	101.2	93.6	92.5	94.5	

ARKANSAS RIVER BASIN

DAVID D. TERRY LOCK AND DAM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1969 thru 1984	1,223.9	2,288.7	2,703.7	2,093.6	2,357.3	3,829.2	4,204.7	4,411.7	3,797.0	1,827.1	797.5	824.9	30,359.3
WY 1984	826.6	1,334.5	1,732.7	547.7	1,678.9	5,694.9	8,230.3	4,760.4	2,237.3	655.9	417.4	319.5	28,736.1
Project Rainfall (inches)													
Avg 1971 thru 1984	3.5	4.9	4.6	3.6	2.8	4.5	4.9	5.8	4.2	3.4	2.4	3.1	47.7
WY 1984	3.5	5.2	8.1	1.3	3.4	5.5	2.9	9.4	1.0	4.3	2.2	2.1	45.9
Deviation	0.0	+0.3	+3.5	-2.3	+0.6	+1.0	-2.0	+0.6	-3.2	+0.8	-0.2	-1.0	-1.8
Pool Elevation													
End of Month	231.06	230.88	231.25	231.03	230.68	230.89	230.81	231.10	231.26	231.27	231.22	231.28	
Maximum	231.46	231.89	231.68	231.57	231.48	231.06	230.94	231.97	232.07	231.67	231.48	231.54	
Minimum	230.84	230.46	230.76	230.79	230.45	230.10	230.12	230.48	231.08	230.97	230.85	230.90	
Pool Content EOM (1,000 AC. FT.)	49.8	49.0	50.6	49.6	48.3	49.1	48.8	50.0	50.7	50.7	50.5	50.8	

LOCK AND DAM NO. 5	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1970 thru 1984	1,271.1	2,447.4	2,577.3	1,968.8	2,062.0	3,851.9	4,212.8	4,377.8	3,799.0	1,779.6	792.7	866.6	30,007.0
WY 1984	802.9	1,599.1	1,865.8	606.4	1,633.9	5,527.9	7,976.6	4,771.1	2,282.4	672.4	458.8	337.2	28,534.5
Project Rainfall (inches)													
Avg 1972 thru 1984	3.6	4.9	5.0	3.1	3.2	4.7	4.7	6.5	3.7	3.5	2.5	3.8	49.2
WY 19834	3.8	5.7	8.9	1.2	3.9	6.2	3.0	12.8	1.3	3.1	7.0	6.6	63.5
Deviation	+0.2	+0.8	+3.9	-1.9	+0.7	+1.5	-1.7	+6.3	-2.4	-0.4	+4.5	+2.8	+14.3
Pool Elevation													
End of Month	213.39	213.19	213.14	213.29	212.21	212.37	212.61	213.10	213.27	213.67	213.36	213.28	
Maximum	213.55	213.51	213.50	213.47	213.58	212.98	212.94	213.98	213.97	213.74	213.77	213.53	
Minimum	213.04	212.60	212.03	212.29	212.21	211.99	211.34	211.83	212.97	212.92	212.89	212.94	
Pool Content EOM (1,000 AC. FT.)	64.1	62.7	62.3	63.4	56.2	57.3	58.8	62.0	63.2	65.8	63.9	63.3	

ARKANSAS RIVER BASIN

LOCK AND DAM NO. 4	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1970 thru 1984	1,276.6	2,471.9	2,636.6	2,034.1	4,265.5	3,972.3	4,388.3	4,535.1	3,949.5	1,810.8	792.5	874.9	33,007.1
WY 1984	806.9	1,555.9	1,791.2	600.0	1,608.5	5,739.9	8,288.8	5,004.3	2,290.3	689.5	403.4	302.3	29,099.0
Project Rainfall (inches)													
Avg 1972 thru 1984	3.4	4.5	5.2	3.7	3.3	4.7	4.6	6.6	3.6	3.6	3.0	4.4	50.6
WY 1984	2.3	5.6	11.1	1.4	4.6	4.6	3.0	9.0	1.4	4.6	5.1	4.1	56.8
Deviation	-1.1	+1.1	+5.9	+2.3	+1.3	-0.1	-1.6	+2.4	-2.2	+1.0	+2.1	-0.3	+6.2
Pool Elevation													
End of Month	196.03	196.02	196.02	196.34	196.01	195.70	196.48	195.75	196.50	196.07	196.18	196.21	
Maximum	196.48	196.93	196.51	196.64	196.68	196.15	196.48	197.00	196.73	196.62	196.67	196.67	
Minimum	195.80	195.80	195.40	195.85	195.19	195.10	194.20	194.65	195.15	195.93	195.00	195.84	
Pool Content EOM (1,000 AC. FT.)	70.6	70.5	70.5	72.6	70.5	68.8	73.6	69.0	73.7	70.9	71.6	71.8	

LOCK AND DAM NO. 3	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1970 thru 1984	1,271.5	2,479.9	2,676.7	2,029.1	2,273.2	3,987.9	4,451.5	4,661.2	3,982.6	1,819.1	770.9	858.6	31,262.2
WY 1984	794.8	1,618.7	2,014.9	597.5	1,654.3	5,874.5	8,264.9	5,311.3	2,317.9	615.3	225.7	301.7	29,591.5
Project Rainfall (inches)													
Avg 1971 thru 1984	3.4	4.4	4.7	3.9	3.0	4.6	4.5	5.8	3.5	3.3	3.4	3.7	48.2
WY 1984	2.1	5.8	9.9	2.9	4.4	4.0	4.2	7.5	3.2	2.4	3.9	1.1	54.7
Deviation	-1.3	+1.4	+5.2	-1.0	+1.4	-0.6	-0.3	+1.7	-0.3	-0.9	+0.5	-2.6	+6.5
Pool Elevation													
End of Month	182.25	182.50	181.84	182.40	181.79	181.22	182.05	182.11	182.20	182.32	182.10	182.48	
Maximum	182.70	184.81	182.90	182.63	182.68	182.02	182.18	182.67	182.58	182.50	182.75	182.62	
Minimum	181.60	181.70	181.15	181.84	181.62	181.13	180.03	181.50	181.22	181.85	181.30	181.74	
Pool Content EOM (1,000 AC. FT.)	47.4	48.4	45.8	48.0	45.6	43.4	46.6	46.8	47.2	47.7	46.8	48.3	

ARKANSAS RIVER BASIN

LOCK AND DAM NO. 2	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Releases (1,000 AC. FT.)													
Avg 1970 thru 1984	1,269.5	2,483.3	2,797.0	2,044.9	2,334.5	4,055.3	4,631.6	4,282.5	4,003.6	1,813.7	782.5	1,519.2	32,017.6
WY 1984	790.1	1,682.4	2,289.1	757.1	1,709.2	5,888.1	9,119.4	5,476.5	2,314.9	634.1	410.4	317.2	31,388.5
Project Rainfall (inches)													
Avg 1971 thru 1984	3.6	5.6	5.6	4.7	4.1	6.6	5.3	5.7	4.4	3.2	3.2	3.8	[illegible]
WY 1984	1.8	8.9	11.2	2.3	6.0	5.9	5.2	8.9	3.7	4.7	5.3	1.1	66.0
Deviation	-1.8	+3.3	+5.6	-2.4	+1.9	-0.8	-0.1	+3.2	-0.7	+1.5	3.1	-2.7	+10.2
Pool Elevation													
End of Month	163.15	162.24	163.38	163.35	161.79	161.94	163.37	160.55	163.18	16[illegible].97	162.86	162.88	
Maximum	163.51	163.61	163.46	163.48	163.46	161.99	163.37	163.50	163.44	[illegible].52	163.14	163.16	
Minimum	162.96	162.24	161.62	162.96	161.74	161.33	160.09	160.55	160.35	[illegible]61.88	162.63	162.65	
Pool Content EOM (1,000 AC. FT.)	123.0	112.8	125.8	125.4	107.9	109.5	125.6	95.2	123.4	[illegible]20.9	119.6	119.9	

NORRELL LOCK NO. 1 (No basic data collected)

RED RIVER BASIN

ALTUS LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1938 THRU 1981	7.13	2.75	3.44	3.77	5.05	5.93	9.57	29.65	20.95	8.39	3.01	3.01	102.7
FY 1984	18.31	1.30	1.43	2.63	2.83	4.60	6.13	2.97	3.35	0.82	0.76	0.12	45.3
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	0.06	0.09	0.07	0.00	0.16	0.68	0.56	19.89	6.36	9.89	7.55	0.56	45.9
FY 1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0
RAINFALL(INCHES)													
AVG 1930 THRU 1980	1.99	0.88	0.77	0.63	0.83	1.19	1.99	4.09	3.19	2.21	2.50	2.30	22.57
FY 1984	4.37	0.34	0.14	0.03	0.51	1.14	1.09	0.21	2.58	0.50	1.37	0.23	12.51
DEVIATION	2.38	-0.54	-0.63	-0.60	-0.32	-0.05	-0.90	-3.88	-0.61	-1.71	-1.13	-2.07	-10.06
POOL ELEVATION													
END OF MONTH	1542.78	1542.94	1543.07	1543.68	1544.30	1545.11	1546.12	1545.90	1543.59	1538.40	1528.28	1525.26	
MAXIMUM	1542.78	1542.98	1543.12	1543.68	1544.32	1545.11	1546.14	1546.22	1545.90	1543.60	1538.40	1528.28	
MINIMUM	1537.20	1542.78	1542.93	1543.07	1543.68	1544.30	1545.11	1545.90	1543.58	1538.40	1528.28	1525.26	
POOL CONTENT-EOM (1000AC.FT)	56.20	56.77	57.23	59.46	61.75	64.81	68.77	67.90	57.47	40.13	15.02	9.49	

RED RIVER BASIN

MOUNTAIN PARK DAM	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1926 THRU 1931	1.51	0.45	0.36	0.25	0.33	0.66	1.38	5.73	4.07	1.29	0.73	1.77	18.5
FY 1984	35.45	1.01	0.33	1.03	1.39	1.93	1.16	1.06	2.94	0.71	0.06	0.06	47.1
RELEASES(1000AC.FT.)													
AVG 1981 THRU 1984	0.38	1.64	0.00	0.00	0.00	0.05	0.06	0.05	0.30	0.97	0.00	0.00	3.5
FY 1984	1.51	6.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.1
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.49	1.35	1.14	1.03	1.18	1.55	2.43	4.82	3.37	2.15	2.26	2.87	26.64
FY 1984	11.45	1.27	0.35	0.05	1.14	1.76	1.30	0.19	4.09	1.28	1.46	0.14	24.48
DEVIATION	8.96	-0.08	-0.79	-0.98	-0.04	0.21	-1.13	-4.63	0.72	-0.87	-0.80	-2.73	-2.16
POOL ELEVATION													
END OF MONTH	1412.03	1410.94	1410.67	1410.60	1410.45	1410.40	1410.00	1409.43	1409.12	1408.36	1407.59	1406.76	
MAXIMUM	1412.35	1412.09	1410.94	1410.70	1410.60	1410.44	1410.42	1410.00	1409.45	1409.12	1408.36	1407.59	
MINIMUM	1406.40	1410.94	1410.67	1410.60	1410.44	1410.24	1410.00	1409.43	1409.12	1408.36	1407.59	1406.76	
POOL CONTENT-EOM (1000AC.FT)	96.10	88.59	86.90	86.46	85.52	85.21	82.70	79.33	77.50	73.15	68.86	64.37	

RED RIVER BASIN

LAKE KEMP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1924 THRU 1981	22.20	5.94	6.74	3.73	5.59	7.68	12.78	38.02	25.29	15.57	18.91	27.01	189.4
FY 1984	150.91	13.64	4.45	5.57	3.58	9.28	5.84	7.01	8.59	4.26	8.02	3.38	224.5
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	4.87	4.48	1.83	0.00	0.46	4.84	4.00	4.53	8.14	16.05	13.03	5.92	68.2
FY 1984	12.62	36.48	0.00	0.00	0.13	14.95	5.45	18.67	15.51	20.23	13.86	2.02	139.9
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.41	1.08	0.98	0.83	1.00	1.10	1.88	3.66	2.73	1.99	2.22	2.92	22.80
FY 1984	7.79	0.96	0.07	0.01	0.44	0.48	0.11	0.25	0.60	0.95	1.84	0.34	13.84
DEVIATION	5.38	-0.12	-0.91	-0.82	-0.56	-0.62	-1.77	-3.41	-2.13	-1.04	-0.38	-2.58	-8.96
POOL ELEVATION													
END OF MONTH	1146.02	1144.41	1144.58	1144.84	1144.91	1144.24	1143.67	1142.17	1140.73	1138.66	1137.46	1136.99	
MAXIMUM	1146.23	1146.02	1144.58	1144.84	1145.04	1144.91	1144.29	1143.67	1142.17	1140.73	1138.65	1137.46	
MINIMUM	1135.41	1144.22	1144.41	1144.58	1144.80	1144.24	1143.67	1142.17	1140.73	1138.66	1137.46	1136.71	
POOL CONTENT-EOM (1000AC.FT)	300.84	274.52	277.22	281.35	282.47	271.81	262.98	240.68	220.61	194.35	180.92	175.90	

RED RIVER BASIN

WAURIKA LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1925 THRU 1981	7.81	4.14	3.26	1.71	3.76	5.22	7.51	26.25	17.73	3.32	1.70	4.28	86.7
FY 1984	150.93	0.45	1.94	1.37	3.58	12.31	5.10	3.47	3.90	1.02	1.86	0.00	185.9
RELEASES(1000AC.FT.)													
AVG 1983 THRU 1984	15.30	47.14	0.00	0.00	2.10	3.78	1.17	10.95	2.51	0.00	0.00	0.00	83.0
FY 1984	30.60	94.27	0.00	0.00	4.21	7.55	1.02	0.00	0.00	0.00	0.00	0.00	137.6
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.92	1.79	1.47	1.30	1.47	1.94	2.75	5.21	3.61	2.31	2.36	3.26	30.39
FY 1984	11.83	1.38	0.38	0.10	0.99	2.68	0.84	1.23	2.97	0.47	1.10	1.49	25.46
DEVIATION	8.91	-0.41	-1.09	-1.20	-0.48	0.74	-1.91	-3.98	-0.64	-1.84	-1.26	-1.77	-4.93
POOL ELEVATION													
END OF MONTH	959.65	951.39	951.43	951.61	951.33	951.51	951.44	951.24	950.96	950.18	949.71	949.07	
MAXIMUM	961.72	959.65	951.62	951.82	951.87	952.18	951.70	951.65	951.30	951.05	950.24	949.78	
MINIMUM	949.38	951.35	951.31	951.43	951.33	951.31	951.35	951.21	950.96	950.18	949.71	949.07	
POOL CONTENT-EOM (1000AC.FT)	302.57	202.85	203.37	205.24	202.33	204.20	203.48	201.40	198.48	190.37	185.69	179.48	

RED RIVER BASIN

FOSS RESERVOIR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1926 THRU 1980	3.53	1.79	1.23	1.31	1.79	2.86	9.36	15.36	12.37	3.69	2.11	2.87	59.3
FY 1984	3.22	1.50	0.45	2.50	3.86	4.62	5.68	3.45	5.93	0.66	0.50	0.53	32.9
RELEASES(1000AC.FT.)													
AVG 1978 THRU 1984	1.91	0.30	0.27	0.30	0.52	0.29	0.97	3.00	11.16	3.08	0.49	0.37	22.7
FY 1984	0.61	0.59	0.61	0.61	0.57	0.61	0.59	0.61	0.18	0.61	0.61	0.59	6.8
RAINFALL(INCHES)													
AVG 1930 THRU 1980	1.92	1.06	0.76	0.64	0.88	1.30	2.25	4.23	3.11	1.98	2.44	2.25	22.80
FY 1984	3.87	0.46	0.08	0.07	0.45	1.17	2.18	0.38	2.72	0.36	1.48	0.14	13.36
DEVIATION	1.95	-0.60	-0.66	-0.57	-0.43	-0.13	-0.07	-3.85	-0.39	-1.62	-0.96	-2.11	-9.44
POOL ELEVATION													
END OF MONTH	1637.72	1637.66	1637.42	1637.55	1637.86	1638.24	1638.62	1638.50	1638.65	1637.83	1637.11	1636.43	
MAXIMUM	1637.78	1637.77	1637.66	1637.55	1637.86	1638.24	1638.65	1638.70	1638.72	1638.65	1637.83	1637.11	
MINIMUM	1637.34	1637.66	1637.42	1637.41	1637.55	1637.83	1638.24	1638.50	1638.15	1637.83	1637.11	1636.43	
POOL CONTENT-EOM (1000AC.FT)	150.61	150.26	148.82	149.60	151.45	153.76	156.10	155.36	156.28	151.27	146.97	142.99	

RED RIVER BASIN

FORT COBB RESERVOIR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1926 THRU 1981	2.94	1.88	2.05	2.27	2.38	3.09	4.10	6.26	5.89	2.86	1.85	2.41	38.0
FY 1984	17.02	0.79	0.95	1.73	3.67	2.01	2.64	1.12	2.41	0.03	0.06	0.00	32.4
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	0.34	0.59	0.00	0.00	0.11	0.25	0.00	0.22	6.09	0.90	0.10	0.00	8.6
FY 1984	3.03	5.30	0.00	0.00	0.00	2.21	0.00	0.00	0.00	0.00	0.92	0.00	11.5
RAINFALL(INCHES)													
AVG 1930 THRU 1980	2.37	1.39	1.18	1.00	1.12	1.62	2.64	4.78	3.67	2.28	2.47	3.07	27.59
FY 1984	10.30	0.88	0.17	0.01	1.44	1.92	2.15	0.27	2.92	0.09	0.42	0.12	20.69
DEVIATION	7.93	-0.51	-1.01	-0.99	0.32	0.30	-0.49	-4.51	-0.75	-2.19	-2.05	-2.95	-6.90
POOL ELEVATION													
END OF MONTH	1343.33	1341.94	1341.90	1342.03	1342.47	1342.00	1342.12	1341.72	1341.50	1340.52	1339.24	1338.04	
MAXIMUM	1344.09	1343.33	1341.99	1342.03	1342.50	1342.47	1342.30	1342.13	1341.72	1341.50	1340.52	1339.24	
MINIMUM	1339.93	1341.94	1341.89	1341.90	1342.03	1342.00	1342.00	1341.72	1341.49	1340.52	1339.24	1338.04	
POOL CONTENT-EOM (1000AC.FT)	85.53	79.77	79.61	80.13	81.96	80.01	80.51	78.80	77.99	74.11	69.21	64.80	

RED RIVER BASIN

ARBUCKLE RESERVOIR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1926 THRU 1981	3.80	3.24	3.29	3.07	4.90	5.63	8.07	12.49	7.59	2.94	2.12	3.76	60.9
FY 1984	1.32	0.75	0.09	1.02	1.33	5.39	4.72	2.29	2.42	0.18	0.20	0.10	19.8
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	1.76	0.63	0.29	0.12	1.59	1.10	2.96	10.73	9.54	0.35	0.29	0.13	29.6
FY 1984	0.05	0.06	0.06	0.06	0.06	1.40	3.20	1.02	0.06	0.06	0.06	0.06	6.2
RAINFALL(INCHES)													
AVG 1930 THRU 1930	3.48	2.33	2.06	1.75	2.21	2.92	3.86	5.65	3.90	2.48	2.78	3.75	37.17
FY 1984	5.40	3.15	0.65	0.87	1.69	3.38	2.79	2.56	4.49	1.44	0.83	1.72	28.97
DEVIATION	1.92	0.82	-1.41	-0.88	-0.52	0.46	-1.07	-3.09	0.59	-1.04	-1.95	-2.03	-8.20
POOL ELEVATION													
END OF MONTH	870.66	870.69	870.45	870.64	870.85	872.19	872.16	871.89	872.22	871.35	870.56	869.49	
MAXIMUM	870.77	870.72	870.70	870.64	870.85	872.43	872.58	872.37	872.30	872.22	871.35	870.56	
MINIMUM	870.39	870.56	870.45	870.45	870.62	870.85	871.97	871.89	871.84	871.35	870.56	869.49	
POOL CONTENT-EOM (1000AC.FT)	69.30	69.37	68.82	69.26	69.74	72.85	72.79	72.14	72.92	70.89	69.08	66.67	

RED RIVER BASIN

LAKE TEXOMA	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1906 THRU 1981	366.34	199.55	190.83	140.89	166.47	227.06	413.04	812.92	688.44	214.49	177.99	240.90	3828.9
FY 1984	1415.26	477.02	104.93	125.95	130.51	244.12	201.28	135.70	167.80	32.03	31.83	13.88	3080.3
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	272.19	237.84	113.72	110.65	86.16	102.29	129.03	334.62	714.92	298.73	142.08	91.51	2633.7
FY 1984	694.74	756.86	174.31	93.15	84.98	266.38	223.44	133.76	147.76	138.49	105.89	14.92	2834.7
RAINFALL(INCHES)													
AVG 1930 THRU 1930	2.49	1.39	1.22	1.13	1.28	1.64	2.48	4.39	3.30	2.20	2.33	2.89	26.74
FY 1984	7.27	0.99	0.10	0.13	0.83	1.80	0.74	0.75	2.19	0.64	1.28	0.68	17.40
DEVIATION	4.78	-0.40	-1.12	-1.00	-0.45	0.16	-1.74	-3.64	-1.11	-1.56	-1.05	-2.21	-9.34
POOL ELEVATION													
END OF MONTH	620.54	617.21	616.31	616.63	616.86	616.37	615.65	615.17	614.86	612.80	611.21	610.63	
MAXIMUM	620.83	620.54	617.32	616.72	617.02	616.91	616.57	615.97	615.55	614.86	612.80	611.21	
MINIMUM	611.79	617.20	616.31	616.31	616.60	615.95	615.65	615.17	614.86	612.80	611.21	610.63	
POOL CONTENT-EOM (1000AC.FT)	2972.79	2662.20	2583.61	2611.29	2631.19	2588.80	2528.80	2490.40	2465.88	2307.74	2191.02	2149.71	

RED RIVER BASIN

PAT MAYSE LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1937 THRU 1981	4.89	7.23	7.99	6.38	11.78	12.30	16.04	15.77	10.14	3.64	1.49	4.15	101.8
FY 1984	1.31	0.84	0.45	0.77	33.86	23.31	12.77	29.94	0.06	0.13	1.55	0.25	105.3
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	0.40	2.47	2.51	1.32	5.09	11.88	9.61	11.42	12.64	6.16	0.75	0.00	64.3
FY 1984	0.00	0.00	0.00	0.00	5.93	21.85	18.03	28.35	1.90	0.02	0.00	0.00	76.1
RAINFALL(INCHES)													
AVG 1930 THRU 1990	3.55	3.39	3.21	2.76	3.09	3.74	4.71	5.30	4.01	3.28	2.62	4.19	43.85
FY 1984	2.77	2.78	0.69	0.96	4.03	4.58	2.12	4.34	1.33	3.18	1.79	1.24	29.81
DEVIATION	-0.78	-0.61	-2.52	-1.80	0.94	0.84	-2.59	-0.96	-2.68	-0.10	-0.83	-2.95	-14.04
POOL ELEVATION													
END OF MONTH	449.69	449.49	449.21	449.09	453.43	453.47	452.14	451.88	450.96	450.29	449.90	449.35	
MAXIMUM	449.89	449.68	449.57	449.27	453.56	453.70	453.55	455.85	451.88	451.00	450.39	449.93	
MINIMUM	449.68	449.46	449.21	449.09	449.00	452.25	452.14	451.88	450.96	450.29	449.90	449.35	
POOL CONTENT-EOM (1000AC.FT)	116.74	115.64	114.02	113.32	139.55	139.81	131.47	129.87	124.26	120.31	118.02	114.83	

RED RIVER BASIN

SARDIS LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1926 THRU 1981	9.07	15.39	20.38	21.79	26.99	30.93	39.85	39.52	19.89	6.87	2.66	9.87	245.9
FY 1984	2.79	5.46	6.28	6.52	22.35	69.12	23.61	17.08	5.26	2.77	2.32	3.95	167.5
RELEASES(1000AC.FT.)													
LAKE HAS NOT FILLED													
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.44	3.40	2.79	2.50	3.01	3.63	4.78	6.03	4.34	3.54	3.28	4.57	45.30
FY 1984	3.29	2.31	0.75	0.87	1.98	4.41	2.18	2.90	2.74	2.32	2.37	3.96	30.08
DEVIATION	-0.15	-1.09	-2.03	-1.63	-1.03	0.78	-2.60	-3.13	-1.60	-1.22	-0.91	-0.61	-15.22
POOL ELEVATION													
END OF MONTH	590.71	591.06	591.50	592.09	593.76	596.21	596.07	596.05	596.03	595.74	595.45	595.39	
MAXIMUM	590.81	591.06	591.54	592.04	593.76	597.09	596.41	596.51	596.10	596.03	595.74	595.45	
MINIMUM	590.59	590.59	591.06	591.50	591.94	593.69	595.97	595.96	595.94	595.74	595.43	595.23	
POOL CONTENT-EOM (1000AC.FT)	195.99	199.98	204.90	210.60	231.67	262.91	261.04	260.77	260.50	256.75	253.00	252.23	

RED RIVER BASIN

HUGO LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1926 THRU 1964	40.79	74.01	117.34	160.37	177.57	171.23	257.85	250.16	114.02	56.90	19.14	48.05	1485.4
FY 1984	6.92	24.66	38.44	43.04	121.39	360.69	120.36	160.96	19.87	14.22	5.64	14.68	930.9
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	29.99	35.74	80.34	70.59	146.68	208.98	219.61	206.21	144.84	58.92	18.12	13.13	1225.2
FY 1984	8.61	3.90	25.61	41.49	94.99	363.78	136.61	155.98	20.42	18.67	18.84	13.63	902.5
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.65	3.75	3.19	2.85	3.27	3.92	5.03	6.09	4.24	3.54	3.31	4.55	47.39
FY 1984	3.32	3.13	1.11	1.32	2.53	4.65	1.71	3.70	2.20	2.14	1.88	3.35	31.04
DEVIATION	-0.33	-0.62	-2.08	-1.53	-0.74	0.73	-3.32	-2.39	-2.04	-1.40	-1.43	-1.20	-16.35
POOL ELEVATION													
END OF MONTH	402.04	403.85	404.74	404.80	406.57	406.19	404.64	404.70	404.27	403.46	401.99	401.88	
MAXIMUM	402.41	403.85	404.94	405.35	407.04	408.63	406.19	407.16	404.70	404.28	403.46	401.99	
MINIMUM	402.04	401.96	403.85	404.72	404.44	404.53	404.50	404.36	404.17	403.46	401.99	401.17	
POOL CONTENT-EOM (1000AC.FT)	126.59	148.94	160.79	161.60	186.33	180.71	159.44	160.25	154.44	144.10	125.99	124.77	

RED RIVER BASIN

PINE CREEK LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1929 THRU 1981	22.63	38.04	56.04	60.24	78.03	92.93	95.41	104.78	42.28	17.31	8.38	22.66	628.7
FY 1984	4.25	10.31	40.20	19.77	82.02	181.86	45.20	74.97	8.57	5.81	1.04	5.67	479.7
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	18.16	9.22	40.67	36.72	58.64	88.25	77.39	92.58	67.69	15.74	6.14	5.00	516.2
FY 1984	4.00	7.60	41.88	20.48	61.06	138.82	89.71	68.25	8.52	14.79	4.25	4.90	464.3
RAINFALL(INCHES)													
AVG 1930 THRU 1980	3.76	3.89	3.57	3.12	3.49	4.25	5.15	6.21	4.28	3.87	3.53	4.67	49.80
FY 1984	3.50	2.39	1.06	1.25	1.98	3.04	1.05	2.91	1.42	1.74	1.50	1.86	23.70
DEVIATION	-0.26	-1.59	-2.53	-1.87	-1.50	-1.21	-4.10	-3.30	-2.86	-2.13	-2.03	-2.81	-26.10
POOL ELEVATION													
END OF MONTH	437.95	438.75	438.30	438.12	442.88	450.25	442.02	443.02	442.64	440.15	438.98	438.90	
MAXIMUM	438.05	439.06	440.55	438.71	443.66	450.90	450.25	449.21	443.02	442.67	440.15	438.98	
MINIMUM	437.42	437.46	437.39	437.96	438.09	438.45	441.05	442.02	442.33	440.15	438.98	438.00	
POOL CONTENT-EOM (1000AC.FT)	53.57	56.64	54.91	54.21	74.66	117.16	70.58	75.33	73.52	62.32	57.53	57.22	

RED RIVER BASIN

BROKEN BOW LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS(1000AC.FT.)													
AVG 1930 THRU 1981	34.81	58.40	95.11	111.71	114.40	140.87	130.36	138.16	52.17	26.71	14.15	23.55	948.4
FY 1984	11.81	40.10	108.97	26.34	156.34	273.66	70.09	151.36	13.03	13.45	3.87	46.18	915.2
RELEASES(1000AC.FT.)													
AVG 1976 THRU 1984	24.20	19.07	65.74	62.51	58.53	90.70	114.16	109.62	103.42	61.29	42.19	24.98	776.6
FY 1984	19.41	12.22	73.54	39.19	77.59	87.39	196.08	129.35	30.43	42.55	37.92	30.99	796.7
RAINFALL(INCHES)													
AVG 1930 THRU 1980	4.14	4.08	4.15	3.72	3.83	4.89	5.29	6.29	4.31	4.23	3.69	4.60	53.21
FY 1984	4.20	4.60	2.81	1.49	3.86	6.96	2.06	7.36	1.13	3.44	2.25	5.47	45.63
DEVIATION	0.06	0.52	-1.34	-2.23	0.03	2.07	-3.22	1.07	-3.18	-0.79	-1.44	0.87	-7.58
POOL ELEVATION													
END OF MONTH	594.77	586.80	589.26	588.35	594.29	607.23	598.20	599.50	597.82	595.25	592.32	593.12	
MAXIMUM	587.22	586.82	594.02	589.31	594.31	607.35	607.23	604.71	599.53	597.82	595.25	593.15	
MINIMUM	584.77	584.00	586.80	587.64	587.87	594.25	598.17	598.20	597.82	595.23	592.32	590.42	
POOL CONTENT-EOM (1000AC.FT)	723.46	748.63	779.82	768.28	845.99	1032.03	899.76	918.09	894.44	859.00	819.68	830.29	

RED RIVER BASIN

DEQUEEN LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1930 thru 1984	6.1	13.5	21.5	23.9	24.5	30.3	28.9	30.8	10.9	6.2	3.9	6.2	206.7
WY 1984	3.2	11.3	28.8	11.3	26.5	56.6	18.3	37.6	1.9	1.8	3.1	6.7	207.1
Releases (1,000 AC. FT.)													
Avg 1979 thru 1984	8.9	8.5	27.9	15.5	20.3	26.1	28.0	35.4	28.0	15.6	6.2	1.7	222.1
WY 1984	0.8	1.8	29.7	10.7	25.4	39.8	34.9	36.5	3.0	1.5	1.7	5.1	190.9
Basin Rainfall (inches)													
Avg 1930 thru 1984	3.8	4.3	4.2	3.7	3.8	4.9	5.3	6.5	4.2	4.4	3.3	4.3	52.7
WY 1984	5.7	4.6	4.9	1.9	4.8	8.3	3.7	8.8	2.3	5.0	4.4	6.6	61.0
Deviation	+1.9	+0.3	+0.7	-1.8	+1.0	+3.4	-1.6	+2.3	-1.9	+0.6	+1.1	+2.3	+8.3
Pool Elevation													
End of Month	431.35	437.42	436.77	436.99	437.48	446.05	437.16	437.48	436.41	436.15	436.61	437.31	
Maximum	431.35	437.53	443.48	438.00	443.33	447.78	446.05	447.59	437.48	436.53	436.72	438.31	
Minimum	429.28	431.20	436.74	436.77	436.99	436.69	436.85	437.06	436.38	436.11	436.09	436.16	
Pool Content EOM (1,000 AC. FT.)	26.3	35.6	34.5	34.9	35.7	52.3	35.2	35.7	33.9	33.5	34.3	35.4	

GILLHAM LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1930 thru 1984	11.5	24.3	40.2	45.7	43.8	55.4	49.3	50.7	19.9	11.0	5.2	9.8	366.8
WY 1984	4.9	17.3	46.4	15.4	48.4	95.8	34.3	55.3	2.9	4.2	4.7	11.9	341.5
Releases (1,000 AC. FT.)													
Avg 1977 thru 1984	7.2	15.6	42.9	33.9	34.1	42.9	64.9	56.8	37.1	15.7	11.6	2.9	365.6
WY 1984	0.0	0.0	47.3	18.5	43.2	74.8	56.9	55.4	5.5	3.3	10.5	4.3	319.7
Basin Rainfall (inches)													
Avg 1930 thru 1984	4.0	4.5	4.3	3.9	4.0	5.1	5.3	6.5	4.6	4.4	3.3	4.6	54.5
WY 1984	5.2	5.6	4.7	1.6	4.8	8.8	3.6	8.4	1.7	5.4	3.7	7.4	60.9
Deviation	+1.2	+1.1	+0.4	-2.3	+0.8	+3.7	-1.7	+1.9	-2.9	+1.0	+0.4	+2.8	+6.4
Pool Elevation													
End of Month	490.94	504.94	504.25	501.95	505.40	517.60	504.27	503.80	501.65	501.93	501.86	502.55	
Maximum	490.94	504.94	527.85	504.25	511.66	520.97	517.60	517.35	503.80	501.93	503.00	505.45	
Minimum	485.43	490.94	504.25	501.65	501.95	501.74	501.38	502.55	501.62	501.18	501.86	501.35	
Pool Content EOM (1,000 AC. FT.)	20.0	37.2	36.2	32.9	37.9	58.7	36.2	35.6	32.6	32.9	32.8	33.7	

RED RIVER BASIN

DIERKS LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1930 thru 1984	4.1	9.4	16.3	19.3	17.7	22.0	19.3	21.7	7.4	4.4	1.2	3.2	146.0
WY 1984	5.2	4.9	18.5	4.9	17.2	30.2	9.4	22.4	0.3	1.5	1.5	1.9	117.9
Releases (1,000 AC. FT.)													
Avg 1977 thru 1984	3.1	5.0	14.2	15.1	13.2	17.6	18.4	19.2	12.3	8.8	2.5	0.9	130.3
WY 1984	1.4	4.4	18.8	5.1	15.4	18.6	21.9	18.3	3.7	0.9	0.7	0.7	109.9
Basin Rainfall (inches)													
Avg 1930 thru 1984	4.5	4.6	4.5	4.0	4.1	5.1	5.3	6.3	4.9	4.1	3.2	3.9	54.5
WY 1984	6.3	4.1	5.2	1.8	4.2	6.8	3.0	8.8	1.5	6.4	3.2	6.3	57.6
Deviation	+1.8	-0.5	+0.7	-2.2	+0.1	+1.7	-2.3	+2.5	-3.4	+2.3	0.0	+2.4	+3.1
Pool Elevation													
End of Month	526.09	526.43	526.17	525.90	527.07	534.28	525.95	528.47	525.67	525.65	525.90	526.45	
Maximum	526.71	527.22	532.95	526.68	530.54	534.60	534.28	535.43	528.47	525.67	526.16	526.45	
Minimum	523.04	525.93	525.51	525.83	525.30	526.07	525.95	525.94	525.67	525.22	525.63	525.60	
Pool Content EOM (1,000 AC. FT.)	29.8	30.2	29.8	29.5	31.1	42.4	29.6	33.2	29.2	29.2	29.5	30.2	

MILLWOOD LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1,000 AC. FT.)													
Avg 1929 thru 1984	111.4	235.5	382.3	438.2	488.5	576.6	601.9	670.9	293.4	129.9	71.9	98.9	4,009.4
WY 1984	62.5	61.8	358.4	179.1	432.9	843.8	609.9	783.6	82.2	84.5	62.8	96.6	3,658.1
Releases (1,000 AC. FT.)													
Avg 1976 thru 1984	90.8	139.9	378.9	293.4	354.5	487.9	517.7	521.7	401.7	229.1	74.4	70.2	3,560.2
WY 1984	56.8	55.6	346.3	191.3	420.3	805.5	642.4	763.7	77.1	76.4	45.6	148.4	3,629.4
Intervening Basin Rainfall (inches)													
Avg 1930 thru 1984	3.8	4.3	3.9	3.6	3.8	4.4	4.8	5.9	4.0	3.6	2.9	3.9	48.9
WY 1984	4.2	3.9	4.7	1.9	4.9	7.1	3.1	8.2	2.0	4.9	4.1	5.8	54.8
Deviation	+0.4	-0.4	+0.8	-1.7	+1.1	+2.7	-1.7	+2.3	-2.0	+0.7	+1.2	+1.9	+5.9
Pool Elevation													
End of Month	259.28	259.38	259.71	259.20	259.48	260.56	259.22	259.54	259.34	259.20	259.46	257.30	
Maximum	259.47	259.56	261.02	259.86	260.76	260.82	260.56	263.74	259.65	259.54	259.60	259.69	
Minimum	259.21	259.28	259.33	259.20	259.16	259.24	259.22	259.18	259.23	259.19	259.18	257.30	
Pool Content EOM (1,000 AC. FT.)	207.5	210.5	220.4	205.1	213.5	246.9	205.7	215.3	209.3	205.1	212.9	153.5	

RED RIVER BASIN

WRIGHT PATMAN LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1957 THRU 1982	77	165	220	165	229	257	286	438	195	66	19	38	2155
FY 1984	0	3	37	21	110	350	302	84	0	12	0	1	920
RELEASES (1000 AC,FT.)													
AVG 1957 THRU 1982	109	152	191	205	216	234	200	274	252	166	52	48	2099
FY 1984	14	50	33	12	43	199	357	17	14	14	14	6	773
RAINFALL (INCHES)													
AVG 1957 THRU 1977	3.66	3.29	3.65	2.47	3.06	3.93	4.87	4.44	4.25	3.40	2.67	4.86	44.57
FY 1984	2.52	3.33	3.19	1.62	4.10	5.68	2.21	4.49	1.94	3.37	1.66	3.04	37.15
DEVIATION	-1.16	0.04	-0.46	-0.85	1.04	1.75	-2.66	0.05	-2.31	-0.63	-1.01	-1.82	-7.42
POOL ELEVATION													
END OF MONTH	223.37	221.03	220.79	220.84	223.32	227.95	226.03	227.54	226.44	225.66	224.56	223.76	
MAXIMUM	224.39	223.37	221.54	220.89	223.58	226.14	230.99	227.74	227.54	226.53	225.66	224.56	
MINIMUM	223.37	221.03	220.79	220.70	220.66	223.31	226.03	225.94	224.44	225.66	224.56	223.76	
POOL CONTENT EOM (1000 AC.FT.)	223	167	162	163	222	362	259	348	312	288	256	234	

BIG RIVER BASIN

LAKE O THE PINES

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1958 THRU 1982	10	25	45	53	56	75	78	64	31	10	5	13	465
FY 1984	1	4	12	6	26	32	11	3	1	0	1	0	97
RELEASES (1000 AC,FT.)													
AVG 1958 THRU 1982	10	15	41	49	54	66	58	58	35	15	11	13	427
FY 1984	3	2	2	2	7	33	15	3	2	2	2	2	75
RAINFALL (INCHES)													
AVG 1957 THRU 1977	3.07	3.53	3.69	2.59	3.16	3.73	4.90	4.01	3.73	2.79	2.33	3.93	41.46
FY 1984	1.89	3.42	4.14	1.50	2.88	3.64	1.66	2.48	2.19	2.54	1.98	2.53	31.07
DEVIATION	-1.18	-0.11	0.45	-1.09	-0.28	0.11	-3.22	-1.53	-1.54	-0.25	-0.35	-1.40	-10.39
POOL ELEVATION													
END OF MONTH	228.16	228.06	228.39	228.64	229.49	229.25	228.80	228.40	227.87	227.22	226.72	226.12	
MAXIMUM	228.61	228.22	228.57	228.71	229.61	229.61	229.25	228.85	228.40	227.87	227.22	226.72	
MINIMUM	228.16	227.91	228.06	228.54	228.60	229.12	228.70	228.41	227.87	227.22	226.72	226.10	
POOL CONTENT EOM (1000 AC.FT.)	249	247	253	258	274	269	260	253	243	232	223	212	

NECHES RIVER BASIN

SAM RAYBURN RESERVOIR

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1908 THRU 1982	40	86	172	256	258	282	289	313	136	58	34	32	1956
FY 1984	6	75	336	209	413	440	114	123	53	12	25	16	1822
RELEASES (1000 AC.FT.)													
AVG 1965 THRU 1982	52	42	62	94	114	143	146	209	190	147	143	92	1434
FY 1984	96	111	81	37	215	499	131	100	151	177	148	117	1863
RAINFALL (INCHES)													
AVG 1931 THRU 1960	3.15	4.67	5.02	4.65	4.18	3.69	4.64	5.22	3.55	3.72	2.93	2.87	46.29
FY 1984	1.68	4.39	5.23	2.47	5.14	4.31	1.45	3.66	2.88	1.86	1.57	2.69	37.33
DEVIATION	-1.47	-0.28	0.21	-2.18	0.96	0.62	-3.19	-1.56	-0.67	-1.86	-1.36	-0.18	-10.96
POOL ELEVATION													
END OF MONTH	161.42	160.62	162.95	164.36	165.83	165.05	164.60	164.36	163.07	161.02	159.32	157.87	
MAXIMUM	162.64	161.40	163.47	164.39	166.42	166.48	165.12	164.61	164.36	163.07	161.02	159.32	
MINIMUM	161.40	160.49	160.80	162.95	164.36	165.09	164.54	164.10	163.06	161.02	159.32	157.87	
POOL CONTENT EOM (1000 AC.FT.)	2569	2506	2735	2894	3065	2978	2921	2854	2748	2527	2351	2208	

NECHES RIVER BASIN

B.A. STEINHAGEN LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1908 THRU 1982	74	151	284	438	439	495	514	607	290	141	81	67	3581
FY 1984	123	178	293	203	522	681	278	210	192	202	166	133	3381
RELEASES (1000 AC.FT.)													
AVG 1951 THRU 1982	96	130	234	313	338	376	406	601	294	178	122	108	3196
FY 1984	139	154	309	188	524	879	275	207	187	181	161	144	3346
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.92	4.25	4.71	4.10	3.59	3.92	4.60	5.00	3.43	3.27	2.81	2.85	45.45
FY 1984	1.70	4.35	4.69	2.62	5.53	4.37	1.42	4.33	3.20	1.53	1.77	2.39	37.90
DEVIATION	-1.22	0.10	-0.02	-1.48	1.94	0.45	-3.16	-0.67	-0.23	-1.74	-1.04	-0.46	-7.55
POOL ELEVATION													
END OF MONTH	80.78	82.58	81.03	82.17	81.81	81.77	81.66	81.46	81.49	82.63	82.48	81.18	
MAXIMUM	82.80	83.37	83.56	82.67	84.45	83.27	81.86	83.18	82.60	83.34	83.25	82.46	
MINIMUM	80.14	80.50	80.57	80.12	80.57	81.01	80.78	81.42	80.59	81.45	81.57	80.85	
POOL CONTENT EOM (1000 AC.FT.)	67	89	70	83	79	78	77	75	75	89	87	72	

TRINITY RIVER BASIN

BENBROOK LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1924 THRU 1982	2	3	2	3	6	7	9	14	6	2	1	1	56
FY 1984	4	1	0	1	2	4	1	1	1	1	1	0	17
RELEASES (1000 AC.FT.)													
AVG 1952 THRU 1982	1	4	2	2	4	5	5	10	11	2	2	1	49
FY 1984	1	2	2	0	0	1	1	1	1	1	1	1	12
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.83	2.22	2.30	2.06	2.06	2.36	3.79	4.75	3.28	2.16	2.10	2.44	32.35
FY 1984	2.07	2.58	0.45	1.08	2.10	5.03	1.23	1.87	2.60	1.50	1.38	0.70	22.59
DEVIATION	-0.76	0.36	-1.85	-0.98	0.04	2.67	-2.56	-2.88	-0.68	-0.66	-0.72	-1.74	-9.76
POOL ELEVATION													
END OF MONTH	691.59	689.96	689.29	689.26	689.32	689.92	689.67	689.27	688.76	687.90	687.12	686.27	
MAXIMUM	692.02	690.75	689.96	689.33	689.36	689.57	689.97	689.82	669.33	688.76	687.90	687.12	
MINIMUM	691.06	689.96	689.29	689.25	689.22	689.25	689.67	689.27	688.76	687.90	687.12	686.27	
POOL CONTENT EOM (1000 AC.FT.)	79	74	72	71	72	74	73	71	70	67	64	62	

TRINITY RIVER BASIN

LEWISVILLE LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1924 THRU 1982	41	30	26	24	42	57	74	99	52	19	11	29	504
FY 1984	50	10	5	9	20	67	12	14	13	0	3	2	205
RELEASES (1000 AC.FT.)													
AVG 1954 THRU 1982	30	45	44	27	25	33	33	71	77	41	31	22	479
FY 1984	7	4	12	12	8	6	7	13	18	22	18	14	141
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.96	2.33	2.53	2.14	2.66	2.53	4.08	5.05	3.88	2.57	2.43	2.88	36.04
FY 1984	6.34	2.81	0.72	1.06	2.82	3.85	1.45	3.26	2.27	0.98	2.35	0.81	28.72
DEVIATION	3.38	0.48	-1.81	-1.08	0.16	1.32	-2.63	-1.79	-1.61	-1.59	-0.08	-2.07	-7.32
POOL ELEVATION													
END OF MONTH	512.60	512.52	511.90	511.51	511.77	514.21	513.94	513.36	512.38	510.33	508.65	507.15	
MAXIMUM	512.79	512.67	512.53	511.90	511.77	514.21	514.28	514.22	513.36	512.38	510.53	508.65	
MINIMUM	510.86	512.42	511.90	511.51	511.28	511.77	513.94	513.36	512.38	510.33	508.65	507.15	
POOL CONTENT EOM (1000 AC.FT.)	404	402	389	381	386	440	433	420	399	358	328	303	

TRINITY RIVER BASIN

GRAPEVINE LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1924 THRU 1982	11	6	7	9	13	16	24	30	15	5	2	6	144
FY 1984	15	2	2	2	4	14	3	4	5	0	1	0	52
RELEASES (1000 AC.FT.)													
AVG 1952 THRU 1982	4	8	12	9	6	6	10	12	15	13	11	5	111
FY 1984	11	15	12	2	2	3	6	3	2	2	3	3	64
RAINFALL (INCHES)													
AVG 1931 THRU 1960	3.13	2.19	2.24	1.90	2.26	2.26	3.89	4.46	3.28	2.56	2.48	2.76	33.43
FY 1984	5.78	2.33	0.81	0.98	2.62	3.19	1.42	3.04	1.90	0.73	2.71	0.58	26.09
DEVIATION	2.65	0.14	-1.43	-0.92	0.36	0.93	-2.47	-1.42	-1.38	-1.83	0.23	-2.20	-7.34
POOL ELEVATION													
END OF MONTH	531.45	529.17	527.29	526.98	527.49	528.57	527.66	527.27	527.12	525.93	524.92	523.70	
MAXIMUM	532.40	531.45	529.17	527.10	527.56	528.77	528.57	528.02	527.54	525.12	525.53	524.92	
MINIMUM	530.80	529.17	527.29	526.98	527.30	527.27	527.66	527.27	527.12	525.93	524.92	523.70	
POOL CONTENT EOM (1000 AC.FT.)	156	141	130	128	131	138	132	130	129	122	117	116	

TRINITY RIVER BASIN

LAVON LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1924 THRU 1982	14	19	23	25	35	37	53	69	37	13	3	12	340
FY 1984	10	8	3	5	16	66	21	29	7	1	7	6	179
RELEASES (1000 AC.FT.)													
AVG 1953 THRU 1982	13	14	26	20	15	21	15	58	37	14	7	4	244
FY 1984	0	0	0	0	0	0	0	0	0	0	0	0	0
RAINFALL (INCHES)													
AVG 1931 THRU 1960	3.28	2.87	2.99	2.47	2.82	3.37	4.57	5.24	3.99	2.86	2.71	2.67	39.84
FY 1984	3.87	3.40	1.11	1.32	2.99	4.97	1.82	4.02	3.25	0.77	2.49	1.40	31.41
DEVIATION	0.59	0.53	-1.88	-1.15	0.17	1.60	-2.75	-1.22	-0.74	-2.09	-0.22	-1.27	-8.43
POOL ELEVATION													
END OF MONTH	488.94	488.65	488.08	487.80	488.02	490.73	490.98	491.34	490.54	489.11	487.89	486.75	
MAXIMUM	489.35	488.94	488.66	488.18	488.03	490.73	491.26	491.92	491.34	490.54	489.11	487.89	
MINIMUM	488.94	488.51	488.08	487.80	487.68	487.95	490.72	490.96	490.54	489.11	487.89	489.75	
POOL CONTENT EOM (1000 AC.FT.)	395	369	378	373	377	430	435	443	426	398	374	353	

TRINITY RIVER BASIN

NAVARRO MILLS LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1908 THRU 1982	5	6	8	10	10	12	19	29	14	4	1	3	121
FY 1984	7	1	1	2	3	20	2	6	1	1	1	0	45
RELEASES (1000 AC.FT.)													
AVG 1963 THRU 1982	2	7	6	4	6	7	9	16	22	8	0	2	89
FY 1984	0	0	0	0	0	12	3	0	0	0	0	0	15
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.64	2.60	2.61	2.62	2.80	2.67	4.36	4.98	3.50	1.82	1.60	2.64	34.84
FY 1984	3.67	2.32	1.03	1.59	2.26	3.90	0.93	2.51	2.15	1.14	0.71	0.53	22.74
DEVIATION	1.03	-0.28	-1.58	-1.03	-0.54	1.23	-3.43	-2.47	-1.35	-0.68	-0.89	-2.11	-12.10
POOL ELEVATION													
END OF MONTH	423.93	423.79	423.60	423.65	423.91	425.12	424.42	424.91	424.43	423.61	422.74	422.02	
MAXIMUM	424.09	423.94	423.85	423.73	423.96	425.78	425.15	424.99	424.97	424.42	423.61	422.74	
MINIMUM	422.96	423.75	423.60	423.58	423.59	423.91	424.42	424.08	424.39	423.61	422.74	422.02	
POOL CONTENT EOM (1000 AC.FT.)	54	53	52	53	54	60	57	59	57	53	48	45	

TRINITY RIVER BASIN

BARDWELL LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1938 THRU 1982	3	3	4	4	6	6	11	14	7	2	1	2	63
FY 1984	1	1	1	2	3	13	4	2	1	1	1	0	30
RELEASES (1000 AC.FT.)													
AVG 1965 THRU 1982	1	5	3	3	4	6	6	12	11	2	0	1	54
FY 1984	0	0	0	0	0	7	6	0	0	0	0	0	13
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.90	2.73	2.94	2.53	2.81	2.73	4.11	4.81	3.09	1.98	2.16	2.74	35.53
FY 1984	2.45	2.84	0.77	1.38	2.77	5.08	0.93	2.05	2.13	0.85	0.27	1.43	22.95
DEVIATION	-0.45	0.11	-2.17	-1.15	-0.04	2.35	-3.18	-2.76	-0.96	-1.13	-1.89	-1.31	-12.58
POOL ELEVATION													
END OF MONTH	420.11	420.06	420.03	420.23	420.61	422.17	421.06	420.84	420.48	419.70	418.92	418.19	
MAXIMUM	420.36	420.16	420.11	420.23	420.83	422.61	422.17	421.11	420.43	420.48	419.70	418.52	
MINIMUM	420.11	419.95	420.02	420.03	420.21	420.81	421.06	420.84	420.91	419.70	418.92	418.19	
POOL CONTENT EOM (1000 AC.FT.)	49	49	49	50	52	57	53	52	50	48	45	43	

SAN JACINTO RIVER BASIN

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
BARKER RESERVOIR													
INFLOWS (1000 AC. FT.)													
AVG 1945 THRU 1984	5.5	6.0	6.2	9.5	7.9	3.8	5.2	8.2	9.9	7.5	4.2	7.7	81.6
FY 1984	2.2	2.7	2.0	3.1	6.9	2.1	1.7	3.9	2.5	4.7	5.1	2.8	39.7
RELEASES (1000 AC. FT.)													
AVG 1964 THRU 1984	7.2	6.7	5.8	7.9	8.9	4.9	4.3	9.3	9.2	7.6	3.9	9.5	85.2
FY 1984	7.6	2.7	2.0	3.1	6.9	2.1	1.7	3.9	2.5	4.7	5.1	2.8	45.1
RAINFALL (INCHES)													
AVG 1945 THRU 1984	3.55	3.44	3.24	3.05	2.99	3.16	3.17	4.50	3.77	3.29	3.84	4.26	42.26
FY 1984	0.72	3.06	1.18	2.34	2.92	1.70	0.62	3.19	2.47	6.63	3.49	4.12	32.44
DEVIATION	-2.83	-0.38	-2.06	-0.71	-0.07	-1.46	-2.55	-1.31	-1.30	3.34	-0.35	-0.14	-9.82
POOL ELEVATION													
END OF MONTH	73.69	73.75	73.74	73.86	74.04	73.73	73.96	73.75	74.56	74.41	73.76	73.77	
MAXIMUM	86.90	76.52	74.79	80.03	82.73	74.58	74.00	92.56	78.73	76.21	77.08	78.67	
MINIMUM	73.69	73.69	73.74	73.73	73.74	73.73	73.72	73.72	73.71	73.76	73.76	73.76	
POOL CONTENT E.O.M. (1000 AC. FT.)	0	0	0	0	0	0	0	0	0	0	0	0	
ADDICKS RESERVOIR													
INFLOWS (1000 AC. FT.)													
AVG 1948 THRU 1984	9.0	6.0	6.4	6.3	7.4	3.3	5.6	8.2	7.0	5.6	5.8	6.8	74.6
FY 1984	2.2	4.2	5.5	4.2	7.2	2.9	1.6	5.3	2.8	9.8	4.6	3.6	53.8
RELEASES (1000 AC. FT.)													
AVG 1964 THRU 1984	9.1	7.0	6.5	7.2	7.9	3.7	4.6	9.9	7.2	6.1	4.2	9.6	81.0
FY 1984	6.9	4.4	5.5	4.2	7.2	2.3	1.6	5.3	2.8	9.8	4.6	3.6	58.7
RAINFALL (INCHES)													
AVG 1948 THRU 1984	3.82	3.47	3.31	3.33	3.22	2.19	3.31	4.29	3.66	3.29	3.43	4.42	41.44
FY 1984	0.97	3.75	1.47	2.53	5.34	2.11	0.69	3.50	2.17	6.07	1.50	2.65	32.75
DEVIATION	-2.85	0.28	-1.84	-0.80	2.12	-0.09	-2.62	-0.75	-1.51	2.79	-1.93	-1.77	-8.69
POOL ELEVATION													
END OF MONTH	71.59	72.29	71.79	71.86	71.32	71.57	71.70	71.59	74.77	77.30	71.75	71.74	
MAXIMUM	89.53	77.27	75.56	81.96	85.40	77.85	72.40	84.97	79.95	91.52	79.62	90.75	
MINIMUM	71.57	71.57	71.82	71.74	71.81	71.57	71.66	71.58	71.68	71.75	71.74	71.72	
POOL CONTENT E.O.M. (1000 AC. FT.)	0	0	0	0	0	0	0	0	0	0	0	0	

BRAZOS RIVER BASIN

WHITNEY LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1899 THRU 1982	120	68	67	55	60	68	135	279	170	99	72	108	1301
FY 1984	25	8	48	41	8	33	15	29	17	4	5	3	236
RELEASES (1000 AC.FT.)													
AVG 1951 THRU 1982	99	57	39	51	43	55	61	216	180	83	53	71	1008
FY 1984	1	1	2	1	1	15	31	52	21	30	30	2	187
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.86	1.94	2.16	1.96	2.25	2.06	3.45	4.76	2.97	2.07	1.81	2.76	31.11
FY 1984	1.94	1.53	0.60	1.41	1.77	4.38	0.93	1.97	2.57	1.12	0.58	1.21	20.41
DEVIATION	-0.94	-0.41	-1.56	-0.55	-0.48	2.32	-2.56	-2.79	-0.40	-0.95	-0.83	-1.55	-10.70
POOL ELEVATION													
END OF MONTH	525.73	525.78	527.94	529.70	529.73	530.19	528.93	527.14	526.23	523.95	521.63	521.07	
MAXIMUM	525.80	525.85	527.94	529.75	529.98	530.79	530.19	528.93	527.46	526.24	523.95	521.63	
MINIMUM	524.81	525.61	525.80	527.94	529.60	529.58	528.93	527.11	526.23	523.95	521.63	521.07	
POOL CONTENT EOM (1000 AC.FT.)	474	475	516	553	553	563	536	500	483	443	405	396	

BRAZOS RIVER BASIN

AQUILLA

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1982 THRU 1982	0	0	0	0	0	0	0	0	0	0	0	0	0
FY 1984	0	0	0	0	1	7	0	0	0	0	0	0	8
RELEASES (1000 AC.FT.)													
AVG 1982 THRU 1982	0	0	0	0	0	0	0	0	0	0	0	0	0
FY 1984	0	0	0	0	0	0	0	0	0	0	0	0	0
RAINFALL (INCHES)													
AVG 1931 THRU 1960	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
FY 1984	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
DEVIATION	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
POOL ELEVATION													
END OF MONTH	511.35	512.11	512.07	512.32	512.70	518.84	518.70	518.32	517.82	517.06	517.38	515.76	
MAXIMUM	511.41	512.13	512.15	512.32	512.70	518.86	518.96	518.66	516.26	517.83	517.38	516.36	
MINIMUM	511.30	511.35	512.07	512.06	512.30	512.74	518.70	518.32	517.84	517.66	517.04	515.74	
POOL CONTENT EOM (1000 AC.FT.)	5	5	5	5	6	12	12	11	11	10	9	8	

BRAZOS RIVER BASIN

WACO LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1907 THRU 1982	25	16	20	18	24	26	47	70	31	14	8	17	316
FY 1984	2	2	1	2	3	13	2	3	2	2	3	1	36
RELEASES (1000 AC.FT.)													
AVG 1965 THRU 1982	9	14	13	16	20	29	36	75	30	16	3	5	266
FY 1984	0	0	0	0	0	0	0	0	0	0	0	0	0
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.58	2.19	2.50	2.26	2.39	2.09	3.63	4.83	2.88	2.14	1.67	3.00	32.36
FY 1984	2.12	1.58	1.00	1.19	1.80	3.50	0.81	2.38	2.99	0.95	1.35	1.03	20.70
DEVIATION	-0.46	-0.61	-1.50	-1.07	-0.59	1.41	-3.02	-2.45	0.11	-1.19	-0.32	-1.97	-11.66
POOL ELEVATION													
END OF MONTH	450.65	450.33	449.76	449.57	449.33	450.77	450.22	449.53	448.65	447.37	446.29	445.27	
MAXIMUM	451.27	450.80	450.33	449.76	449.57	450.84	450.78	450.21	449.53	448.65	447.37	446.29	
MINIMUM	450.65	450.33	449.76	449.57	449.32	449.31	450.22	449.53	448.65	447.37	446.29	445.27	
POOL CONTENT EOM (1000 AC.FT.)	119	117	113	112	111	120	116	112	107	99	93	87	

BRAZOS RIVER BASIN

PROCTOR LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1922 THRU 1982	3	2	1	3	2	5	5	12	5	2	1	3	44
FY 1984	1	0	0	0	1	5	0	0	9	0	0	0	16
RELEASES (1000 AC.FT.)													
AVG 1963 THRU 1982	3	3	2	3	6	4	9	11	9	8	4	2	64
FY 1984	1	1	0	0	0	0	0	1	3	2	3	2	13
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.71	1.66	1.76	1.65	1.69	1.55	3.06	4.68	2.75	2.08	1.65	2.73	27.97
FY 1984	1.75	0.92	0.86	0.90	1.58	3.01	0.90	1.02	4.11	1.29	1.42	0.81	18.57
DEVIATION	-0.96	-0.74	-0.90	-0.75	-0.11	1.46	-2.16	-3.66	1.36	-0.79	-0.23	-1.92	-9.40
POOL ELEVATION													
END OF MONTH	1155.01	1154.54	1154.24	1154.16	1154.03	1155.47	1154.90	1153.79	1155.14	1153.61	1151.20	1149.48	
MAXIMUM	1155.58	1155.02	1154.55	1154.32	1154.16	1155.57	1155.47	1154.90	1155.81	1155.14	1153.99	1151.20	
MINIMUM	1155.01	1154.54	1154.24	1154.16	1154.03	1153.91	1154.90	1153.85	1153.56	1153.61	1151.20	1149.48	
POOL CONTENT EOM (1000 AC.FT.)	33	31	36	30	30	34	32	29	33	29	23	19	

BRAZOS RIVER BASIN

BELTON LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1908 THRU 1982	31	21	31	31	36	37	65	103	49	24	14	26	466
FY 1984	4	2	0	2	2	14	1	5	11	4	2	2	49
RELEASES (1000 AC.FT.)													
AVG 1954 THRU 1982	25	23	20	26	26	37	34	61	66	46	14	9	387
FY 1984	1	1	1	1	1	1	1	2	13	24	3	9	58
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.61	2.11	2.28	2.10	2.21	1.96	3.56	4.66	2.89	2.07	1.69	2.92	31.06
FY 1984	1.97	1.95	0.75	1.28	1.11	3.33	0.60	1.85	2.72	1.71	0.79	1.24	19.30
DEVIATION	-0.64	-0.16	-1.53	-0.82	-1.10	1.37	-2.96	-2.81	-0.17	-0.36	-0.90	-1.68	-11.76
POOL ELEVATION													
END OF MONTH	592.12	591.72	591.13	590.91	590.60	591.30	590.73	590.16	589.20	566.36	589.28	583.87	
MAXIMUM	592.41	592.15	591.72	591.16	590.91	591.40	591.31	590.73	590.67	569.20	566.38	585.28	
MINIMUM	592.12	591.72	591.13	590.91	590.60	590.60	590.73	590.18	589.20	566.38	565.26	583.87	
POOL CONTENT EOM (1000 AC.FT.)	419	414	407	405	401	409	403	396	385	354	342	328	

BRAZOS RIVER BASIN

STILLHOUSE HOLLOW LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1924 THRU 1982	14	10	12	15	22	23	26	46	21	10	5	11	215
FY 1984	1	0	0	2	1	4	1	1	7	3	0	0	20
RELEASES (1000 AC.FT.)													
AVG 1968 THRU 1982	8	7	9	13	13	16	21	35	25	23	3	6	179
FY 1984	0	0	0	0	0	0	0	10	4	5	15	2	36
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.78	2.16	2.33	2.02	2.13	1.84	3.35	4.42	2.99	1.96	1.92	3.11	31.03
FY 1984	2.16	1.74	0.40	1.68	0.36	2.13	0.47	1.84	2.25	2.13	0.76	1.52	17.44
DEVIATION	-0.62	-0.42	-1.93	-0.34	-1.77	0.29	-2.88	-2.58	-0.74	0.15	-1.16	-1.59	-13.59
POOL ELEVATION													
END OF MONTH	620.57	620.31	619.97	620.05	619.98	620.21	619.89	617.89	617.75	616.72	613.25	612.26	
MAXIMUM	620.87	620.60	620.35	620.12	620.07	620.32	620.23	619.89	617.90	617.75	616.72	613.25	
MINIMUM	620.57	620.31	619.97	619.97	619.98	619.95	619.89	617.89	617.23	616.72	613.25	612.26	
POOL CONTENT EOM (1000 AC.FT.)	227	225	223	223	223	224	222	210	209	203	184	179	

BRAZOS RIVER BASIN

GEORGETOWN LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1980 THRU 1982	4	2	1	1	1	1	2	14	27	3	1	9	66
FY 1984	0	0	0	0	0	0	0	0	5	1	0	0	6
RELEASES (1000 AC.FT.)													
AVG 1980 THRU 1982	3	2	1	0	0	0	1	4	13	16	1	9	50
FY 1984	0	0	0	0	1	0	0	0	0	0	0	0	1
RAINFALL (INCHES)													
AVG 1931 THRU 1960	3.16	2.50	2.38	2.16	2.37	2.03	3.61	4.01	2.89	1.77	2.12	3.46	32.46
FY 1984	2.61	2.10	0.40	1.60	0.27	1.65	0.66	0.92	4.80	1.68	0.65	1.61	18.35
DEVIATION	-0.55	-0.40	-1.98	-0.56	-2.10	-0.38	-2.95	-3.09	1.91	-0.09	-2.07	-1.85	-14.11
POOL ELEVATION													
END OF MONTH	790.16	789.95	789.61	789.47	789.02	788.85	788.31	787.58	790.41	789.75	788.56	787.35	
MAXIMUM	790.42	790.26	789.96	789.73	789.47	789.62	788.85	788.31	790.42	790.41	789.75	788.56	
MINIMUM	790.16	789.95	789.61	789.47	789.02	788.85	788.31	787.58	787.43	789.40	788.56	787.35	
POOL CONTENT EOM (1000 AC.FT.)	36	36	35	35	35	34	34	33	36	35	34	33	

BRAZOS RIVER BASIN

GRANGER LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1980 THRU 1982	10	8	4	4	5	7	9	24	63	22	4	19	179
FY 1984	2	3	3	3	3	3	1	1	4	1	1	1	26
RELEASES (1000 AC.FT.)													
AVG 1980 THRU 1982	9	8	2	2	2	1	5	13	35	45	4	18	144
FY 1984	0	0	0	3	2	2	0	0	16	0	0	0	23
RAINFALL (INCHES)													
AVG 1931 THRU 1960	3.16	2.50	2.38	2.16	2.37	2.03	3.61	4.01	2.89	1.77	2.12	3.46	32.46
FY 1984	2.14	2.19	0.89	1.47	0.64	1.70	0.51	1.52	4.02	2.11	0.45	1.50	19.14
DEVIATION	-1.02	-0.31	-1.49	-0.69	-1.73	-0.33	-3.10	-2.49	1.13	0.34	-1.67	-1.96	-13.32
POOL ELEVATION													
END OF MONTH	503.97	504.18	504.42	504.30	504.21	504.13	503.86	503.56	499.76	499.43	499.64	498.60	
MAXIMUM	504.04	504.21	504.44	504.66	504.49	504.21	504.16	503.89	503.66	499.76	499.43	499.07	
MINIMUM	503.94	503.97	504.17	504.20	504.21	504.05	503.85	503.58	499.65	499.36	499.64	498.60	
POOL CONTENT EOM (1000 AC.FT.)	65	56	67	67	66	66	65	64	49	48	47	45	

BRAZOS RIVER BASIN

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
SOMERVILLE LAKE													
INFLOWS (1000 AC.FT.)													
AVG 1924 THRU 1982	13	14	17	22	23	19	29	38	22	12	3	10	222
FY 1984	3	3	2	4	3	9	0	7	2	3	0	0	36
RELEASES (1000 AC.FT.)													
AVG 1967 THRU 1982	11	12	14	9	17	16	22	33	33	21	5	5	198
FY 1984	0	0	0	0	0	2	15	19	8	12	(	0	56
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.66	3.10	3.15	2.89	2.87	2.44	3.71	3.95	3.43	2.35	2.45	3.09	36.09
FY 1984	2.48	1.65	1.00	1.62	1.34	2.21	0.06	2.53	2.41	1.84	1.04	1.13	19.33
DEVIATION	-0.18	-1.45	-2.15	-1.27	-1.53	-0.23	-3.63	-1.42	-1.02	-0.51	-1.41	-1.96	-16.76
POOL ELEVATION													
END OF MONTH	237.98	237.91	237.82	238.05	238.14	238.44	236.66	234.94	233.77	232.11	231.27	230.77	
MAXIMUM	238.10	238.07	238.05	238.05	238.38	238.59	238.44	236.67	234.94	233.77	231.80	231.28	
MINIMUM	237.93	237.88	237.82	237.80	238.02	238.13	236.66	234.94	233.77	232.11	231.27	230.77	
POOL CONTENT EOM (1000 AC.FT.)	160	159	158	161	162	165	145	127	116	101	94	85	

COLORADO RIVER BASIN

TWIN BUTTES LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1963 THRU 1982	4	2	2	2	2	2	3	5	2	1	4	5	34
FY 1984	6	1	1	2	1	1	1	1	1	1	1	1	18
RELEASES (1000 AC.FT.)													
AVG 1963 THRU 1982	2	2	2	2	2	2	4	6	4	6	4	2	38
FY 1984	2	1	1	0	1	1	3	4	3	3	3	2	24
RAINFALL (INCHES)													
AVG 1931 THRU 1960	1.81	0.76	0.91	0.89	0.83	0.83	1.74	2.89	1.83	1.74	1.45	2.37	18.05
FY 1984	4.34	1.05	0.07	1.76	0.42	0.44	0.17	1.21	1.47	1.09	0.48	3.82	16.32
DEVIATION	2.53	0.29	-0.84	0.87	-0.41	-0.39	-1.57	-1.68	-0.36	-0.65	-0.97	1.45	-1.73
POOL ELEVATION													
END OF MONTH	1925.36	1925.69	1925.95	1925.94	1925.90	1925.66	1925.19	1924.56	1924.36	1923.76	1922.96	1922.22	
MAXIMUM	1925.36	1925.71	1925.95	1926.13	1925.94	1925.92	1925.64	1925.20	1924.57	1924.36	1923.74	1922.94	
MINIMUM	1924.91	1925.39	1925.70	1925.93	1925.87	1925.66	1925.15	1924.56	1923.96	1923.76	1922.96	1922.20	
POOL CONTENT EOM (1000 AC.FT.)	43	42	42	43	43	42	37	33	29	25	21	19	

COLORADO RIVER BASIN

O.C.FISHER LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1915 THRU 1982	4	0	0	0	1	1	4	6	3	3	1	7	30
FY 1984	3	0	0	1	0	0	0	0	0	0	0	0	4
RELEASES (1000 AC.FT.)													
AVG 1953 THRU 1982	2	0	0	0	0	0	0	0	0	1	0	0	3
FY 1984	0	0	0	0	0	0	0	0	1	1	1	1	4
RAINFALL (INCHES)													
AVG 1931 THRU 1960	1.88	0.75	1.04	0.84	0.84	0.86	1.59	2.71	1.91	2.09	1.65	2.18	18.34
FY 1984	4.81	1.23	0.07	1.37	0.41	0.49	0.05	0.56	0.81	0.66	0.61	3.45	14.52
DEVIATION	2.93	0.48	-0.97	0.53	-0.43	-0.37	-1.54	-2.15	-1.10	-1.43	-1.04	1.27	-3.82
POOL ELEVATION													
END OF MONTH	1881.07	1880.84	1880.56	1880.81	1880.70	1880.49	1879.92	1879.23	1878.02	1876.70	1875.31	1874.14	
MAXIMUM	1881.10	1881.17	1880.84	1880.83	1880.84	1880.76	1880.51	1879.93	1879.23	1878.02	1876.76	1875.31	
MINIMUM	1879.60	1880.84	1880.56	1880.56	1880.70	1880.49	1879.92	1875.23	1878.02	1876.76	1875.31	1874.01	
POOL CONTENT EOM (1000 AC.FT.)	26	25	25	25	25	24	23	22	20	18	16	15	

COLORADO RIVER BASIN

HORDS CREEK LAKE	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1962 THRU 1982	0	0	0	0	0	0	1	1	0	0	0	0	2
FY 1984	0	0	0	0	0	0	0	0	0	0	0	0	0
RELEASES (1000 AC.FT.)													
AVG 1953 THRU 1982	0	0	0	0	0	0	0	0	0	0	0	0	0
FY 1984	0	0	0	0	0	0	0	0	0	0	0	0	0
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.49	1.31	1.44	1.56	1.29	1.25	2.90	4.49	2.73	2.38	1.94	3.04	26.82
FY 1984	1.77	1.16	0.18	0.97	0.57	1.63	0.68	0.38	3.50	1.33	3.03	2.46	17.66
DEVIATION	-0.72	-0.15	-1.26	-0.59	-0.72	0.38	-2.22	-4.11	0.77	-1.05	1.09	-0.58	-9.16
POOL ELEVATION													
END OF MONTH	1883.24	1882.72	1882.29	1882.06	1881.69	1881.38	1880.66	1875.83	1879.21	1878.36	1878.03	1878.10	
MAXIMUM	1883.77	1883.24	1882.72	1882.29	1882.06	1881.69	1881.41	1880.66	1879.87	1879.21	1878.42	1878.23	
MINIMUM	1883.24	1882.72	1882.29	1882.06	1881.69	1881.38	1880.66	1879.83	1879.13	1878.36	1878.03	1878.01	
POOL CONTENT EOM (1000 AC.FT.)	2	2	2	2	2	2	2	2	2	2	2	2	

COLORADO RIVER BASIN

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
MARSHALL FORD													
INFLOWS (1000 AC.FT.)													
AVG 1941 THRU 1982	127	63	52	76	81	85	125	237	165	97	86	108	1302
FY 1984	16	16	24	15	15	7	20	45	87	81	58	69	453
RELEASES (1000 AC.FT.)													
AVG 1944 THRU 1982	69	65	50	48	55	69	98	175	173	130	118	80	1130
FY 1984	41	5	15	4	17	17	109	129	147	114	97	95	790
RAINFALL (INCHES)													
AVG 1931 THRU 1960	2.39	1.46	1.42	1.13	1.18	1.27	2.46	3.27	2.50	2.02	2.03	2.76	23.89
FY 1984	2.54	1.74	0.21	1.44	0.57	1.06	0.28	1.39	1.88	1.75	1.57	2.04	16.47
DEVIATION	0.15	0.28	-1.21	0.31	-0.61	-0.21	-2.18	-1.88	-0.62	-0.27	-0.46	-0.72	-7.42
POOL ELEVATION													
END OF MONTH	666.69	667.08	667.47	667.95	667.59	666.67	660.23	653.62	648.65	644.73	640.60	637.64	
MAXIMUM	668.71	667.11	667.52	667.95	668.43	667.75	666.67	660.20	653.62	648.71	644.85	640.74	
MINIMUM	666.69	661.62	666.70	667.39	667.59	666.67	660.23	653.62	648.65	644.70	640.60	637.64	
POOL CONTENT EOM (1000 AC.FT.)	925	931	937	945	939	925	826	736	667	625	577	545	

GUADALUPE RIVER BASIN

CANYON LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
INFLOWS (1000 AC.FT.)													
AVG 1915 THRU 1982	31	16	17	20	21	23	31	40	30	22	18	27	296
FY 1984	8	9	6	9	7	8	5	5	4	2	4	0	67
RELEASES (1000 AC.FT.)													
AVG 1964 THRU 1982	17	17	12	14	18	19	21	26	30	22	27	17	240
FY 1984	4	10	5	5	6	6	5	4	2	1	2	2	52
RAINFALL (INCHES)													
AVG 1931 THRU 1960	3.05	1.67	2.18	2.07	2.20	2.00	3.00	4.03	2.98	2.40	2.07	4.02	31.67
FY 1984	2.91	2.53	0.34	1.41	0.52	0.42	0.24	2.17	2.65	1.65	1.42	0.91	17.17
DEVIATION	-0.14	0.86	-1.84	-0.66	-1.68	-1.58	-2.76	-1.86	-0.33	-0.75	-0.65	-3.11	-14.50
POOL ELEVATION													
END OF MONTH	904.65	904.08	903.93	904.26	904.03	903.85	903.42	902.95	902.55	901.80	901.16	900.31	
MAXIMUM	904.80	904.91	904.14	904.31	904.26	904.06	903.87	903.42	902.96	902.55	901.80	901.16	
MINIMUM	904.50	904.07	903.92	903.93	904.03	903.94	903.42	902.95	902.55	901.80	901.16	900.31	
POOL CONTENT EOM (1000 AC.FT.)	347	343	342	344	342	342	338	334	331	325	321	315	

PLATORO RESERVOIR[1]

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	T
Inflows (1000 Ac-Ft) FY 1984	2.84	1.19	.77	.47	.47	.70	1.90	30.14	31.97	10.42	4.15	2.88	8
Releases (1000 Ac-Ft) FY 1984	3.09	1.10	.77	.61	.37	.75	1.95	10.48	31.66	10.35	4.18	2.79	6
Rainfall (Inches) (DATA IS NOT AVAILABLE DURING THE WINTER MONTHS) FY 1984	1.95	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2.76	2.47	4.51	1.64	
Pool Elevation(EOM)	9972.0	9972.2	9972.2	9971.9	9972.1	9972.0	9972.0	10003.9	10004.2	10004.2	10004.2	10004.2	
Maximum	9972.8	9972.2	9972.2	9972.2	9972.2	9972.3	9972.3	10003.9	10004.6	10004.6	10004.3	10004.3	10004
Minimum	9971.9	9972.0	9971.9	9971.9	9971.6	9972.0	9971.5	9971.8	10004.0	10004.1	10004.2	10004.2	9971
Pool Content (EOM) (1000 Ac-Ft)	14.20	14.28	14.30	14.15	14.25	14.20	14.20	33.80	34.03	34.03	34.03	34.03	

ABIQUIU DAM

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1000 Ac-Ft) Avg 1962 thru 1984	9.36	14.30	20.25	7.04	7.27	16.59	47.20	101.02	53.23	22.33	23.50	15.49	336.5
FY 1984	11.55	11.36	20.91	20.07	24.39	42.86	67.18	215.38	82.87	17.12	22.91	23.02	559.6
Releases (1000 Ac-Ft) Avg 1963 thru 1984	10.20	22.91	22.85	8.34	5.96	15.19	38.55	66.44	60.85	33.18	22.85	15.13	322.4
FY 1984	11.07	11.67	22.65	6.69	5.07	32.05	67.41	119.96	148.21	24.57	27.06	22.72	499.1
Rainfall (Inches) Avg 1957 thru 1984	.87	.54	.37	.33	.25	.54	.48	.71	.63	1.62	1.96	1.13	9.4
FY 1984	.96	.32	.94	.09	.01	1.05	.62	.06	.89	.91	2.83	.60	9.2
Pool Elevation (EOM)	6193.39	6193.10	6192.37	6196.72	6202.38	6205.11	6204.68	6227.89	6211.43	6208.72	6207.06	6206.69	
Maximum	6193.53	6193.43	6193.01	6196.72	6202.38	6205.80	6205.78	6228.09	6227.71	6210.56	6208.70	6207.06	6228.0
Minimum	6193.31	6193.09	6191.09	6192.56	6196.86	6202.64	6204.68	6204.18	6211.43	6208.57	6207.06	6206.65	6191.0
Pool Content (EOM) (1000 Ac-Ft)	104.8	103.9	101.8	114.8	133.4	143.0	141.4	234.1	166.0	156.0	150.0	148.7	

[1] Data for compiling averages unavailable

RIO GRANDE BASIN

COCHITI LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1000 Ac-Ft)													
Avg 1910 thru 1984	48.19	52.23	48.16	122.11	244.73	184.00	88.24	80.58	201.89	84.51	55.13	43.43	1253.2
FY 1984	33.06	33.60	59.56	44.04	41.78	86.99	179.03	410.98	275.84	62.71	48.19	39.65	1314.8
Releases (1000 Ac-Ft)													
Avg 1975 thru 1984	33.78	49.11	53.12	40.26	38.87	64.44	110.44	231.89	223.00	119.33	516.48	43.23	1523.95
FY 1984	32.94	33.06	58.91	44.48	41.75	86.70	177.50	381.04	304.03	59.99	47.25	39.29	1306.94
Rainfall (Inches)													
Avg 1967 thru 1984	.91	.63	.57	.57	.34	.56	.46	.89	.71	1.80	2.38	1.47	11.29
FY 1984	1.04	.29	.68	.40	.01	.90	.45	.01	.18	1.11	3.06	1.09	9.22
Pool Elevation (EOM)	5326.22	5326.45	5326.85	5326.39	5326.32	5326.15	5326.97	5346.90	5326.67	5328.01	5327.88	5327.63	
Maximum	5326.47	5326.50	5329.09	5328.83	5326.56	5327.93	5328.39	5347.61	5346.73	5328.56	5328.37	5328.00	5347.62
Minimum	5326.22	5326.22	5326.02	5326.02	5326.32	5326.15	5326.14	5326.94	5326.15	5326.49	5326.35	5327.37	5326.02
Pool Content (EOM) (1000 Ac-Ft)	45.7	46.0	46.5	46.0	45.9	45.7	46.6	75.4	46.3	47.9	47.7	47.4	

GALISTEO DAM

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1000 Ac-Ft)													
Avg 1971 thru 1984													
FY 1984	INFLOW = OUTFLOW												
Releases (1000 Ac-Ft)													
Avg 1971 thru 1984	.41	.06	.06	.08	.09	.11	.18	.19	.29	1.41	1.16	.82	4.8
FY 1984	.09	.02	.04	.01	0	.01	.17	.03	1.16	.07	1.54	.15	3.2
Rainfall (Inches)													
Avg 1971 thru 1984	.86	.60	.28	.42	.42	.45	.52	.93	.40	1.33	1.58	1.27	9.0
FY 1984	1.34	.48	.33	.39	0	.57	.67	0	.95	.32	2.27	.80	8.1
Pool Elevation (EOM)	NO END OF MONTH STORAGE DURING THE YEAR								5504.53		5503.00		5504.5
Maximum													
Minimum													
Pool Content (EOM) (1000 Ac-Ft)	0	0	0	0	0	0	0	0	0	0	0	0	

RIO GR[illegible]E BASIN

JEMEZ CANYON DAM

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1000 Ac-Ft)													
Avg 1953 thru 1984	1.77	1.79	1.43	1.56	1.67	3.61	13.14	11.67	2.66	1.11	3.03	1.08	44.52
FY 1984	1.64	.89	2.38	1.91	1.64	5.57	18.42	18.96	1.80	1.22	2.47	.25	57.13
Releases (1000 Ac-Ft)													
Avg 1954 thru 1984	1.61	1.83	1.68	1.54	2.35	3.44	10.31	12.70	5.73	1.25	2.86	1.08	46.38
FY 1984	1.57	2.55	.57	2.13	1.33	5.09	16.92	19.93	1.81	.81	1.98	0	54.68
Rainfall (Inches)													
Avg 1953 thru 1984	.94	.42	.40	.38	.35	.38	.33	.73	.46	1.27	1.60	1.09	8.35
FY 1984	1.40	.20	.60	.13	0	.66	.36	0	.49	.52	3.13	.84	8.33
Pool Elevation (EOM)	5161.76	5154.82	5161.75	5160.90	5161.65	5161.62	5165.92	5162.54	5161.35	5161.03	5161.28	5161.33	
Maximum	5162.89	5161.88	5161.75	5162.35	5161.65	5163.47	5165.92	5166.45	5162.76	5164.09	5163.52	5161.33	5166.45
Minimum	5161.62	5154.82	5153.46	5160.84	5160.98	5161.62	5161.61	5162.05	5161.35	5161.03	5160.97	5160.83	5153.46
Pool Content (EOM) (1000 Ac-Ft)	2.52	.78	2.52	2.25	2.49	2.81	4.09	2.78	2.39	2.29	2.37	2.38	

SANTA ROSA LAKE

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1000 Ac-Ft)													
Avg 1981 thru 1984	1.82	1.02	1.10	1.07	.97	1.70	4.49	15.26	13.89	8.06	19.87	7.38	76.63
FY 1984	1.37	1.49	1.58	1.34	1.29	1.20	3.56	21.42	9.51	4.98	9.98	6.85	64.57
Releases (1000 Ac-Ft)													
Avg 1981 thru 1984	.52	.27	.28	.23	.26	.17	.14	7.97	10.19	21.38	11.29	11.16	63.86
FY 1984	1.02	0	0	0	.34	.07	.08	20.16	.22	12.19	15.81	0	49.59
Rainfall (Inches)													
Avg 1981 thru 1984	1.38	.57	.49	.59	.30	.48	.39	1.07	1.80	2.07	4.26	1.59	14.99
FY 1984	2.43	.65	.92	.51	.02	.50	.74	2.39	3.62	1.78	2.64	2.94	19.14
Pool Elevation (EOM)	4695.51	4697.71	4699.79	4701.48	4702.74	4703.50	4706.77	4706.38	4713.93	4706.20	4698.10	4706.25	
Maximum	4697.16	4697.71	4699.79	4701.48	4702.74	4703.50	4706.77	4707.21	4713.93	4716.40	4703.65	4706.25	4716.40
Minimum	4694.85	4695.61	4697.78	4699.83	4701.62	4702.85	4703.51	4674.00	4706.80	4706.20	4672.81	4698.22	4672.81
Pool Content (EOM) (1000 Ac-Ft)	8.68	9.92	11.28	12.53	13.54	14.18	17.18	17.80	25.41	16.62	10.16	16.67	

RIO GRANDE RESERVOIR

TWO RIVERS RESERVOIR

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Inflows (1000 Ac-Ft)													
Avg 1964 thru 1984	.46	.48	.26	.31	.21	.02	.50	.59	.56	.47	1.47	1.55	6.88
FY 1984	.46	0	0	0	0	0	0	0	.17	0	10.11	1.47	12.21
Releases (1000 Ac-Ft)													
Avg 1964 thru 1984	.46	.48	.26	.31	.21	.02	.50	.59	.56	.47	1.43	1.55	6.84
FY 1984	.46	0	0	0	0	0	0	0	.17	0	9.21	1.47	11.31
Rainfall (Inches)													
Avg 1964 thru 1984	2.00	2.80	2.11	.95	.24	.16	.20	.35	.38	.38	.95	1.30	11.82
FY 1984	2.17	1.77	.03	0	0	.05	0	0	2.46	.44	4.99	.43	12.34
Pool Elevation(EOM)	NO END OF MONTH STORAGE DURING THE YEAR										3985.39	3960.60	3985.39
Maximum													
Minimum													
Pool Content (EOM)	0	0	0	0	0	0	0	0	0	0	0	0	

SUMNER LAKE

Data Unavailable

SECTION VIII - MINUTES OF THE TRINITY RIVER BASIN INTERESTS GROUP AND THE ANNUAL SWD WATER MANAGEMENT PERSONNEL MEETING

1. TRINITY RIVER BASIN WATER MANAGEMENT INTERESTS GROUP

2. RESERVOIR CONTROL CENTER

3. HYDROLOGIC ENGINEERING CONFERENCE

MINUTES

FOURTEENTH ANNUAL MEETING

TRINITY RIVER WATER MANAGEMENT INTERESTS GROUP

23 OCTOBER 1984

1. The Fourteenth Annual meeting of the Trinity River Management Interests Group was hosted by the North Texas Municipal Water District at their offices in Wylie, Texas. The meeting was attended by 30 persons. The agenda and a list of attendees are attached as enclosures 1 and 2, respectively.

2. Mr. Terry Coomes, Chief of the Water Management Branch, Southwestern Division, Corps of Engineers opened the meeting and introduced the attendees. He thanked the North Texas Municipal Water District (NTMWD) for hosting the meeting and introduced Mr. Car W. Riehn, Executive Director of NTMWD.

3. Mr. Riehn welcomed the group and invited them to attend a tour of the NTMWD lab and facilities after the meeting.

4. Mr. Frank C. Wells, U.S. Geological Survey, Austin, Texas gave a brief presentation of the methodology and results of trend analysis of selected water quality data in the upper Trinity River Basin, Texas. The detection of trends is not a simple task and changes are often masked by fluctuations in discharge, seasonal variations, and sampling and analytical variability. Statistical trend analysis for dissolved solids and selected major inorganic constituents or properties were performed at 17 gaging stations in the upper Trinity Basin. Significant trends were detected at 6 of the stations. Trend analysis for total organic nitrogen, total ammonia nitrogen, and total phosphours were performed at eight stations and trends in one or more constituents were detected at all 8 stations. Two reports were referenced as available to interested attandees; "A Study of Trends in Total Phosphours Measurements at NASQAN Stations" (paper #2190), and "Nonparametric Tests for Trends in Water-Quality Data Using the Statistical Analysis System" (open file #83-550).

5. Mr. Chuck Whaylen, Tarrant County Water Control and Improvement District Number One (TCWC & ID #1) presented a review of accomplishment during the past year. Water sales were up 23% but the water supply was down. Fifty (50)% of the water demand was met from the East Texas system (Cedar Cr.). The Richland Chambers reservoir project is scheduled for completion the 1st quarter of 1987. The Dam and spillway is 43% complete and land acquisition is 93% complete. They have started baseline studies on the Richland-Chambers watershed. The TCWC & ID #1 plans to monitor the entire basin upstream from the dam to protect the quality of their water supply. Two brochures titled "Tarrant County Water Control and Improvement District Number One" and "Your Water Supply" were distributed to attendees.

6. Mr. Dave Galvin, National Weather Service Forecast Office, Ft. Worth discussed "Automation of the Weather Service Warning Service in the Upper Trinity Basin". A brief discussion of the products stored on AFOS was presented. Distribution of Data Collection Platform precipitation reports through the GOES system was briefly described. The various storm patterns such as synoptic and frontal were discussed. Graphic plots of precipitation on a county basis were shown.

7. Mr. Allen White, Texas Department of Water resources reviewed amendments to the Texas Water Plan. The principal revisions in the published report are in the section titled "Planned Actions and Policy Recommendations". Copies of this section were distributed at the meeting. The revised plan has taken into account the many changes which have occurred since the official plan for the state was adopted 15 years ago. Recognizing that planning must keep pace with an evolving economy, changing public attitudes, and advancing water use technology, recommendations are that the Texas Water plan be officially amended at least every 5 years. A public release dated 25 September 1984 stated that for the revised final version of "Water For Texas: A comprehensive Plan for the Future" you should contact the Texas Department of Water Resources, P. O. Box 13087, Capitol Station, Austin, Texas 78711.

8. Mr. Dennis Allen, Dallas Water Utilities presented a discussion of watershed management. With the urbanization which is occurring around the lakes and in their watersheds there is a need to look at watershed management.

MINUTES

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8. Mr. Dennis Allen, Dallas Water Utilities presented a discussion of watershed management. With the urbanization which is occurring around the lakes and in their watersheds there is a need to look at watershed management.

There is growing concern about protecting the quality of water in the lakes as building around them increases. With the installation of septic tank fields and package sewage treatment plants for small developments around the lakes there may be an impact on the quality of water coming into the lakes. Dallas is trying to see what can be done to protect the water in their lakes. They feel that now is the time to do some planning, before the problems develop. There is a need to collect data over the watershed to define the current conditions. They have established a senior level position that will have responsibility for this monitoring.

9. Mr. Marc Elliot, North Central Texas Council of Government presented a discussion of storm water management relating to the Rush Creek Project for the City of Arlington. There were five storm water issues covered:

   A. Lot to lot drainage problems.
   B. Reduction of flooding of existing structures along the watercourse.
   C. Prevention of lot of lot flooding related to new development.
   D. Prevention of increased future flooding along the watercourse.
   E. Use of the floodplain for improved drainage or public areas.

10. Mr. Arnoldo Escobar, Corps of Engineers, Ft. Worth District gave an update of activities pertinent to the Trinity Basin. The Grapevine Spillway modification is scheduled for completion by October 1986. All of the engineering and design for Joe Pool Lake have been completed and 88% of the land acquisition has been completed. Completion of the embankment, spillway and outlet works is scheduled for April 1986. The Ray Roberts project is under construction and deliberate impoundment of water is scheduled for September 1986. The district is currently in the engineering and design phase of the Cooper Lake. Construction on the dam is scheduled to begin in the summer of 1987.

11. Mr. Owen Ralston, Corps of Engineers, Galveston District reported on changes to Wallisville since the last meeting. A contract for archeological investigation along the alignment of the non-overflow dam was awarded on 17 October 1984. A feature design memo for the non-overflow dam has been drafted and is being reviewed in the District Office. Plans and specifications for the non-overflow dam are scheduled for completion in January 1985.

12. Mr. Jim Scanlan, Fort Worth Water Department presented a discussion of the Village Creek Wastewater Treatment Plant Improvements. The recently completed planning process describes how to best handle the increased wastewater flow for the next 20 years in the Fort Worth planning area. Some of the features of the plan includes increasing sewers, converting to mechanical dewatering of solids, and disposal of solids in a sludge landfill.

AGENDA

Fourteenth Annual Meeting

Trinity River Basin Water Management Interest

Date: 23 October 84
Time: 8:30 a.m. until Noon
Place: North Texas Municipal Water District, Wylie, Texas

I. Introduction - Mr. Terry Coomes, Corps of Engineers, SWD

II. Welcome - Mr. Carl W. Riehn, North Texas Municipal Water

III. Minutes and Comments on 1983 Meeting - Mr. Terry Coomes

IV. Automation of National Weather Service River Service River Summaries - Dave Galvin, National Weather Service, Fort Worth

V. Trend Analysis of Water Quality Data int he Upper Trinity River Basin -Frank Wells, U.S. Geological Survey

VI. Amended Texas Water Plan - Allen White, Texas Department of Water Resources

VII. Watersheed Management - Dennis Allen, Dallas Water Utilities

VIII. Storm Water Management - John Promise, North Central Texas Council of Governments

IX. Status of Corps of Engineers Trinity River Basin Projects - Galveston and Fort Worth Districts

X. Village Creek Wastewater Treatment Plant Improvements - Jim Scanlan, Fort Worth Water Department

XI. Comments and General Discussion

XII. Adjourn

****Tour of NTWMD Facilities and Pumping Plant (Optional)**

Note: A light lunch will be provided compliments of NTMWD.

ENCLOSURE 1

ATTENDANCE LIST
TRINITY BSN MEETING

	NAME	ORGANIZATION	PHONE
1.	Dennis L. Allen	Dallas Water Utilities	670-3155
2.	David G. Morris	National Weather Serv.- RFC	334-3833
3.	William J. Herb	USGS - WRD Ft. Worth, TX	334-5551
4.	Frank C. Wells	USGS -WRD Austin, TX	512-482-5561
5.	Terry Coomes	Corps of Engrs. Dallas, TX	767-2385
6.	Owen Ralston	Corps of Engrs. Galveston, TX	409-766-3168
7.	Larry R. Base	City of Lewisville	221-1335
8.	Charles H. Sullivan	Corps of Engrs. Dallas, TX	767-2388
9.	Allen Mullins	City of Arlington	817-275-3271
10.	Bob Bennett	Texas Electric Service Co.	
11.	Chuck Whaylen	TCWC & ID #1 Ft. Worth	817-335-2491
12.	Lee C. Bradley Jr.	Ft. Worth Water Dept.	817-870-8240
13.	Larry W. Schmidt	City of Arlington	817-275-3271
14.	Jim Scanlan	City of Ft. Worth	817-870-8203
15.	I.M. Rice	Trinity Improvement Assoc.	256-2333
16.	Arnoldo Escobar	Corps of Engrs. Ft. Worth	817-535-8415
17.	Paul J. Nix	NCTCOG	817-461-3300
18.	Marc Elliott	NCTOCOG	817-461-3300
19.	Frances Pelly	TRPC	786-2955
20.	Charles Bresett	City of Carrollton	323-5037
21.	Gifford Ely	National Weather Serv. WSFO	334-3401
22.	Richard Browning	Trinity River Authority	467-4343
23.	Sam Scott	Trinity River Authority	467-4343
24.	Dave Galvin	National Weather Serv.	334-3401
25.	Dave Smith	National Weather Serv.	334-2674
26.	Allen White	Texas Department of Water Resources	
27.	John R. Parks	Corps of Engineers, Dallas, Tx	767-2387
28.	Carl W. Riehn	North Texas Municipal Water District	442-5405
29.	Bob Mansell	North Texas Municipal Water District	442-5405
30.	Jerry L. Hammers	Lavon Lake Project Office	442-5711

ENCLOSURE 2 .

MINUTES
1984 ANNUAL MEETING
RESERVOIR CONTROL CENTER
SOUTHWESTERN DIVISION
CORPS OF ENGINEERS
14 NOVEMBER 1984

1. **Introduction.** The 1984 Annual Reservoir Control Center (RCC) Meeting was held on 14 November 1984 in the Southwestern Division (SWD) Office, Dallas, Texas. Mr. R. Terry Coomes, Chief of the SWD Water Management Branch, welcomed the group and encouraged continued district participation in the annually scheduled meetings. He also stated that the attendance at these meeting requires a relative large number of people being out of the office at the same time. For this reason, dates for scheduling of upcoming meetings will be looked at more closely. Terry complimented district participants on the good work that had been performed during the past year in the area of water control activities. However, he emphasized the need for accelerated development of water control manuals and continued development of the Water Control Data System (WCDS). Mr. Charles Sullivan, Chief of the RCC, finished the introductory portion of the meeting by summarizing agenda items for both the morning and afternoon sessions. The agenda and attendance list are enclosed as attachments 1 and 2, respectively.

2. **DISTRICT STATUS REPORTS.**

a. **Fort Worth District.** Mr. Arnoldo Escobar reported the District's activities for the past year. Special operations at O.C. Fisher Lake were required for the City of San Angelo. The Upper Colorado River Authority requested and received approval from the State of Texas for use of up to 10,000 acre-feet of water stored in the sediment reserve storage space of the lake. The low lake level condition placed the elevation of the lake below the low-flow conduit invert elevation, therefore outflow releases were made using the flood gates. Special operations were also required for Granger Lake due to a maintenance contract for painting the outlet conduit at Belton Lake. Outflow releases from Belton were restricted and as a result of release restrictions, the project was unable to supply its share of water

supply needs to the Brazos River System. Therefore, the Brazos River Authority made a special request to the Fort Worth district to provide additional water to their system from Granger Lake. Arnoldo continued his discussion by stating that flood control operations were sporadic during the past year. Seven flood control projects out of the District's total of 22 used part of their flood control storage. B.A. Steinhagen Lake which reregulates surges due to power releases from Sam Rayburn Reservoir and is regulated to maintain the reservoir to elevation 83.0 in order to minimize non-damaging flow (20,000 cfs) downstream of the project. However, on 12 February 1984, intense rains occurred upsteam of the project which created a maximum peak runoff of 60,000 cfs into the lake thereby raising the lake level from 81.98 to 84.45 feet, ngvd. Emergency gate operations resulted in a peak overflow of 26,780 cfs and prevented the spillway from being overtopped by less than 0.5 feet. To provide real time hydrologic data in preparation of forecasting and regulating B.A. Steinhagen, a 506A HANDAR DCP was loaned to the district for six weeks. Lake levels and precipitation data were transmitted at random timed intervals and self time when alert ranges were exceeded. An additional feature on the DCP is a speech modem which places phone calls to the district office relaying hydrologic data. The district will purchase 5 similar DCP's to be installed at the project in FY 85. Mr. Escobar reported that the district made three requests for deviations. In response to these deviations, the district has been discussing internal lines of communications to be followed during all types of emergency operations which effect projects operations. The Engineering Division has circulated a DF addressing the need to notify appropriate personnel when district activities may require a deviation form regulation plans. Since the district has the responsibility to notify each user of their storage remaining at any given time, an interim accounting procedure of conservation storage in Whitney Lake was developed to sumulate daily operational conditions. The accounting method has been forwarded to BRA and SWPA for review and comments. Other items of interest for the year were: 1) The acquisition and installation of 12 rainfall gages and DCP's to establish criteria for real-time forecasting procedures for the Upper Trinity River Basin. The DSS database is now operational and real time forecasting for the Grapevine and Lewisville Lakes watersheds is possible.

2) A direct line link between the National Weather Service Data General S/140 computer and the District's 100 computer was installed. This installation will allow for real time capture of NWS AFOS data.

b. Little Rock District. Mr. James Proctor stated that the district's water control activities for the past year were average if overall activities are considered. The district experienced about 85 to 90 percent average runoff which resulted in utilizing some flood storage in most of the district lakes. However, all flood waters were evacuated during late May and early June 1984. The timing of these releases greatly assisted downstream farmers in their irrigation of corps. Past year's hydropower generations and lake recreation activities were near average for the district. Navigation tonnage along the lower McClellan-Kerr Arkansas River navigation system was up 21 percent over the past year. Jim reported that the district had 11 deviations from their approved plans of regulation with three for shoaling problems along the navigation system (the Tulsa District provided assistance during this period with upstream taper operations), three for canoing events, one for fish and wildlife management purposes and one for taste and odor control problems. The district's water quality and sedment programs continued at minimum levels. Regulation activities for D.O. and water temperature were considered to be normal. Releases were made from Table Rock during July to assist in alleviating taste and odor problems in the downsteam Lake Taneycomo. Cooperative Programs with the National Weather Service (NWS) and the U.S. Geological Survey (USGS) were continued. Jim noted that interest in real time data collection by the USGS has improved and he feels the improvement is largely due to the DCP program, the MOU between the district and the USGS, Etc. The district's Acoustic Velocity Meter (AVM) for the Arkansas River at Dardanelle was installed in August 1984. The meter failed to operate due to problems in the interfacing of the AVM and the DCP. Problems are currently being investigated. Primary reporting parameters are to be velocity and flow. The accuracy of the AVM is expected to be in the range of 10 percent. Maintenance cost is expected to be 2 to $3,000 greater than a conventional gaging station; however, it is expected that the cost will decrease in future years. Mr. Proctor also stated that the Little Rock District has plans to install similar equipment below other large multipurpose

project within the district. By contract, regulation plan alteratives or Blue Mountain Lake was completed in September 1984. These alternatives will be evaluated to provide a basis for recommending changes to current plan. Evaluation of plans are expected to be completed during FY 85. Studies on the White River Lakes Restudy and the Table Rock D.O. alternatives were continued. Several proposals for Non-Federal Hydropower development at corps projects were reviewed. To date, the FERC has granted six licenses to construct facilities at corps projects within the district. The district's WCDS was placed in service during the past year. Software development is still lagging; but, expects to make good progress during the upcoming year. The old radio data collection system has been phased out due to the installation of the WCDS. Other items of general interests as reported by Jim included the 1). Continued litigation on barge incidents at Dam 2 which were caused by the severe flood event of December 1982. 2). Difficulty encountered due to turnover of personnel within the Reservoir Control Section, i.e; lost three experienced people and replaced with three inexperienced. Turnover of this type has caused adverse impacts on Water Control Manual Development. Jim stated that the solution, in his opinion, is to upgrade positions within his section. He is currently proposing such an upgrade.

c. **Tulsa District.** Mr. Ross Copley reported that the district experienced a wide range of climatic conditions from severe droughts to devastating floods. The flood which occurred in Tulsa, OK on 26 and 27 May 1984 produced rainfall amounts up to 13 inches and resulted in the most costly in the city's history. However, the food had no significant impacts on reservoir operations. Only two navigation TAPERS were run for the year. District's Reservoir Control Section personnel visted 21 projects during the past year.

d. **Galveston District.** Mr. Jim Koselski reported that both Addicks and Barker watersheds experienced about 10 inches below normal annual rainfall and as a result there were no significant flood control activities at either project. Development continues to take place in the reservoir areas for which the district has great concern for impacts on future flood control operations. Jim stated that the district has already begun to receive complaints from the city of Houston due to inundation

of roads in the reservoir areas. Corps studies during the year included the submission of dam safety reports to SWD for approval and the start of a planning study to investigate the feasibility of providing conservation storage by leeving areas within the flood pools of Addicks and Barker. Jim concluded his report by expressing concern for a request received from the NWS. The NWS's request is to have the Galveston District Reservoir Control Section make streamflow forecasts below Addicks and Barker for public dissemination. Jim was not sure that this was something the Corps would want to undertake; however, after the group's discussion on some of the potential positive results of accepting this responsibility, additional consideration will be given to the request.

e. Albuquerque District. Mr. Bob Easley summarized the district's past year activities. He stated that all Corps projects were visited by Reservoir Regulation Personnel except for Trinidad and Santa Rosa. Flow on both the Rio Grande and the Arkansas River was above average during the past year; however, no major flooding occurred. All reservoir flood storage was evacuated during the snowmelt runoff period (April - June) except for Abiquiu Reservoir. Starting in July, Abiquiu contained Approximately 1, 700 Acre - Feet of flood water. Bob expects this storage be evacuated prior to the end of the calendar year. Special reservoir operations were required at both Cochiti and John Martin Reservoirs. On two separate occasions, 19-21 December 1983 and 11-13 January 1984, releases from Cochiti were reduced to aid in the search of a drowning victim in the vicinity of Soccorro, New Mexico. For the period 26-30 August 1984 Cochiti releases were increased to dilute raw sewage that was being discharged from a damage sewer line in Albuquerque, New Mexico. Releases from Abiquiu Reservoir were used to replace the Cochiti Recreation Pool to its normal level and sustain Rio Grande flows to a desired dilution level until the line was repaired. John Martin Reservoir releases were terminated for about 2 hours, on 13 June, while divers searched for a drowning victim that was believed to be near the dam.

3. Southwestern Division's 1100 Friday Briefing. Mr. Cliff Victory presented an overview, by District, of water control activities within SWD, current and forecast (Next 2 Days) climatic conditions and stages on the Mississippi River from Cairo to Vicksburg for the purpose of showing the status of conditions for navigation. Mr.

Jerry Smith discussed the dredging operations along the Arkansas River Navigation System and dredging activities along the Gulf Intracostal Waterway. After the briefing, Mr. Sullivan gave an explanation as to why the briefing was give during the Annual RCC meeting. He stated that the purpose was to make District Personnel aware of the kind of briefing given for the exectutive office each Friday by SWDO Personnel, the necessaity for RCC Personnel obtaining data for briefing preparation and to solicit their comments and ideas on format and content of briefings.

4. **Water Control Manuals.** Mr. Ross Copley led the discussion by presenting Tulsa's experience in manual preparation through the use of contracts. The district has hired the services of three firms and has been generally satisfied with their work. However, these contracts only required revisions to existing manuals and did not require the contractor to prepare chapters 5 (Data Collection and Communication Networks), 6 (Hydorologic Forecasts), 7 (Water Control Plan) and 8 (Effect of Water Control Plan) of the manuals. Ross stated that it is realized that these chapters are key to the total manual; but, feels that contracting out other parts of the manual has been beneficial. Ross further stated that the district plans to let contracts for additional manuals in FY 85 and contracts may require the preparation of Chapters 5,6,7 and 8. Mr. Ralph Garland presented the tentative schedule for manual submission to SWD for the period (1 October 84 to 1 January 86). He also summarized the past year's schedule by comparing the number of manuals scheduled versus number actually received. The observation was made that this compairson perhaps, pointed out over optimism in the District's scheduling or lack of ample resources given to manual preparation. It was also noted that several of the manuals shown on attachment 3 had been denoted with an asterisk. Mr. Sullivan explained that these manuals were being considered for placement in SWD's Goals and Objectives. This could be a mechanism for emphasizing the importance of providing sufficient manpower for manual preparation. At the conclusion of a lengthy group debate, it was decided to postpone the decision for placing specified manuals into the goals and objectives programs until additional feedback could be received from affected Districts.

5. **SWD Water Control Data System (WCDS).** Time did not permit this topic to be presented.

6. **Cookbook Documentation of HEC Programs for Reservoir Regulation.** Mr. Elgie Henderson gave a progress report on the Fort Worth District's development of real-time forecasting models with the use of HEC Programs (HEC -1F and HEC-5). The models were developed for Denton Creek and the Elm Fork of the Trinity River above the Carrollton Gaging Station. Elgie stated that they have had good results in reproducing large storm events for model verification; but, have not been successful in reproduction of small storms. Currently the district is working closely with HEC to define and resolve problems. Attachment 4 provides a more detailed description of the model studies.

7. **Database Management for the WCDS.** MESSRS. Gary Lakin, Jim Medlock and Jim McCoy led a panel discussion on databases (Total and Data storage system (DSS) that are currently being evaluated for use in the SWD/WCDS. Mr. Lakin started the discussion by summarizing agenda items as shown on attachment 5. Mr. Medlock discussed the advantages and disadvantages of the data storage system and how it is to be utilized in SWF. See attachment 6. Mr. McCoy presented the database configurations and their advantages and disadvantages. Upon conclusion of the panelist presentations, a lengthy group discussion took place which primarily focussed on the pros and cons of the two database systems. It was decided to continue development of the total database system and implement it on the Dallas system. It would be test run on the Dallas System for approximately two months prior to making a decision on the database configuration to be implemented throughout the division.

8. **General Items.**

a. **Flood Releases to Fill Behind Peaks Of Downstream Hydrographs.** Mr. Coomes opened the discussion by making observations of recent flood operations in both the Tulsa and Little Rock Districts where flood releases were initiated prior to downstream flows receding back to control stages. Such operations should be documented in the project's Water Control Manual if determined to be beneficial. Both the Little Rock and Tulsa Districts have similar operations documented in some manuals and felt they were beneficial, particularily, during certain seasons of the year.

b. **Remoting of Flood Control Gates.** Mr. Coomes began the discussion by stating that he realized that past positions have been not to adopt this mode of operation for flood control gates. However, we are currently remoting hydropower operations at some of the power projects and thinks it is time to reevaluate our position on remoting of flood gates. The general consensus of the group was that the remoting of flood gates is too risky from a safety standpoint.

c. **RCC Annual Report (Format, Timely Reporting, Etc.).** Not discussed due to time limitations.

d. **Non-Federal Hydropower Development.** Not discussed due to time limitations.

AGENDA
1984 ANNUAL MEETING
RESERVOIR CONTROL CENTER
SOUTHWESTERN DIVISION
CORPS OF ENGINEERS
10:00 a.m. On 14 November 1984

I. INTRODUCTION

II. DISTRICT STATUS REPORT

III. SOUTHWESTERN DIVISION'S 1100 FRIDAY BRIEFING

IV. WATER CONTROL MANUALS

V. SWD WATER CONTROL DATA SYSTEM (WCDS)

VI. REGULATION

VII. DATA BASE MANAGEMENT FOR THE WCDS

VIII. GENERAL ITEMS

A. Flood Releases to Fill in Behind Peaks of Downstream Hydrographs

B. Remoting of Flood Control Gates

C. RCC Annual of Report (format, timely reporting, etc)

D. Non-Federal Hydropower Development

IX. **ADJOURN**

NOTE: SYSTEM REGULATION STUDIES WILL BE DISCUSSED IN THE HYDROLOGY MEETING AT 8:00 A.M. ON 15 NOVEMBER 84. THE USER GROUP MEETING WILL START IMMEDIATELY AFTER THIS DISCUSSION.

ATTACHMENT NO. 1

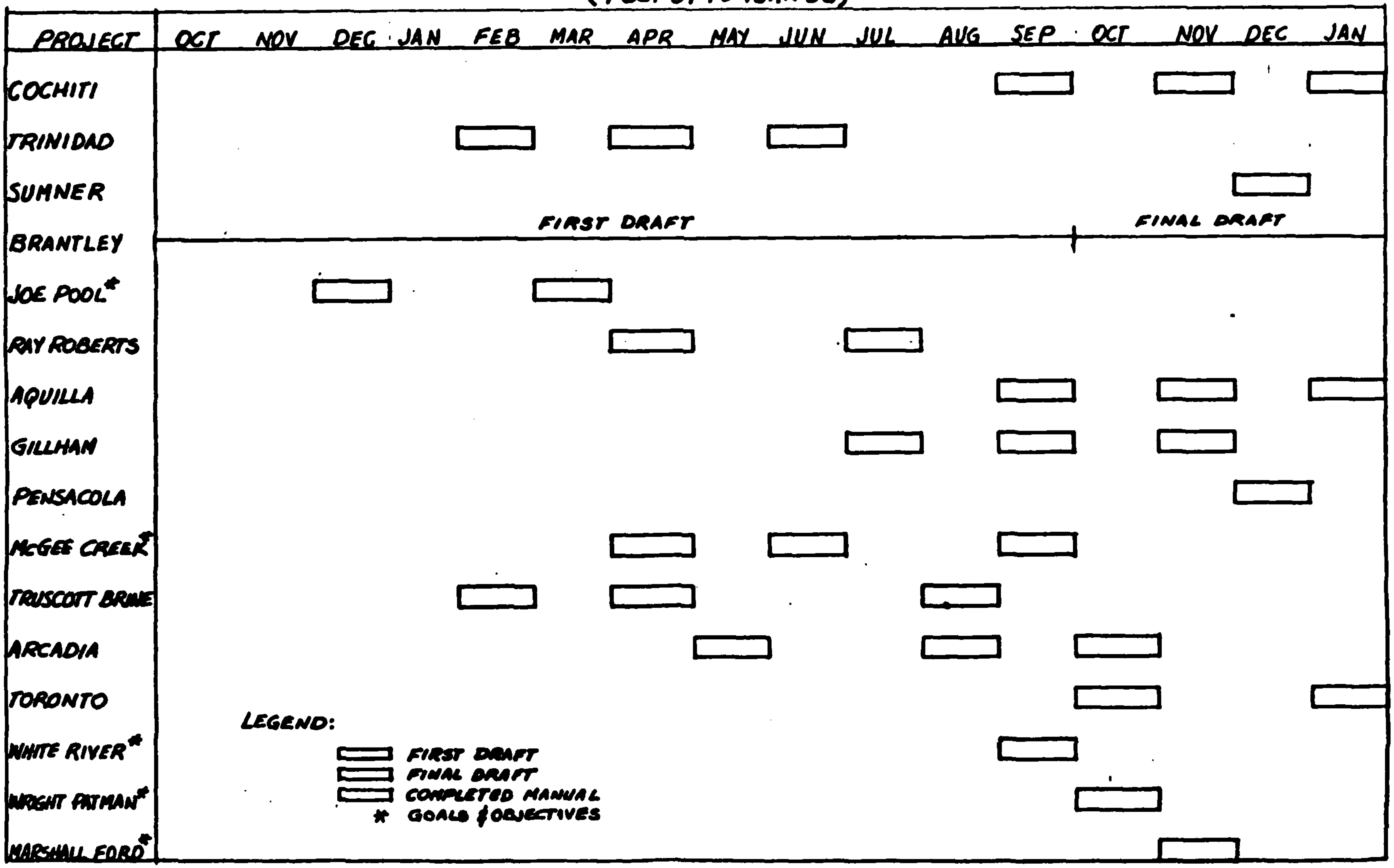
1984 ANNUAL RCC MEETING
14 NOVEMBER 84

ATTENDANCE LIST

Name	ORGANIZATION
James A. Proctor	L. R. D.
Ralph E. Garland	SWDED-WR
Ross R. Copley	SWTED-HR
Jerry Smith	SWD-CD
Carroll Scoggins	SWTED-H
Doug Perrin	SWFED-HL
William E. Jones	SWFED-HL
Arnoldo Escobar	SWFED-HL
Charles Sullivan	SWD
John R. Parks	SWDED-WR
Jim Koselski	SWGED-HC
Bob Easley	SWAED-PH
Bill Isaacs	SWLED-H
Cliff Victory	SWDED-WR
Terry Coomes	SWDED-W
Tasso Schmidgall	SWDED-WA
Gary Lakin	SWDAD-E
Jim McCoy	SWTED-HS
Ralph Hight	SWTED-HC
Jim Medlock	SWFED-HH
Elgie Henderson	SWFED-HH
Steve Pilney	SWFED-HH

ATTACHMENT NO. 2

TENTATIVE SCHEDULE FOR SUBMISSION & REVIEW OF WATER CONTROL PLANS/MANUALS
(1 OCT 84 TO 1 JAN 86)



ATTACHMENT 3

ELM FORK REAL-TIME FORECASTING SYSTEM

A Real-Time Forecasting System was developed for Denton Creek and the Elm Fork of the Trinity River above the Carrollton streamflow gage on the Elm Fork. The total drainage area upstream of the Carrollton gage is 2459 square miles. There are 695 square miles upstream of Grapevine dam site, 1660 square miles upstream of Lewisville dam site, and 104 square miles of local drainage area between the two dam sites and the Carrollton gage. (see figure 1)

The Real-Time Forecasting System consists of several programs. Each program is run in sequence to obtain the data needed to run the subsequent program. The title and purpose of each program is as follows:

DATASTAT - Examines the Master Data Base to determine what gage data has been recorded for the period of time in which we are interested as determined by the forecast time and look back time. (A sample of DATASTAT output is shown in Exhibit 1)

CONVERT - Reads "end of period storage" data for reservoirs and uses it in conjunction with "observed reservoir outflow" data to determine the "observed inflow hydrograph" to the reservoir. It writes "observed reservoir inflow hydrograph" data to the Master Data Base.

EXTRACT - Extracts the desired data from the Master Data Base for the pertinent gages and writes the data to a Data Storage File.

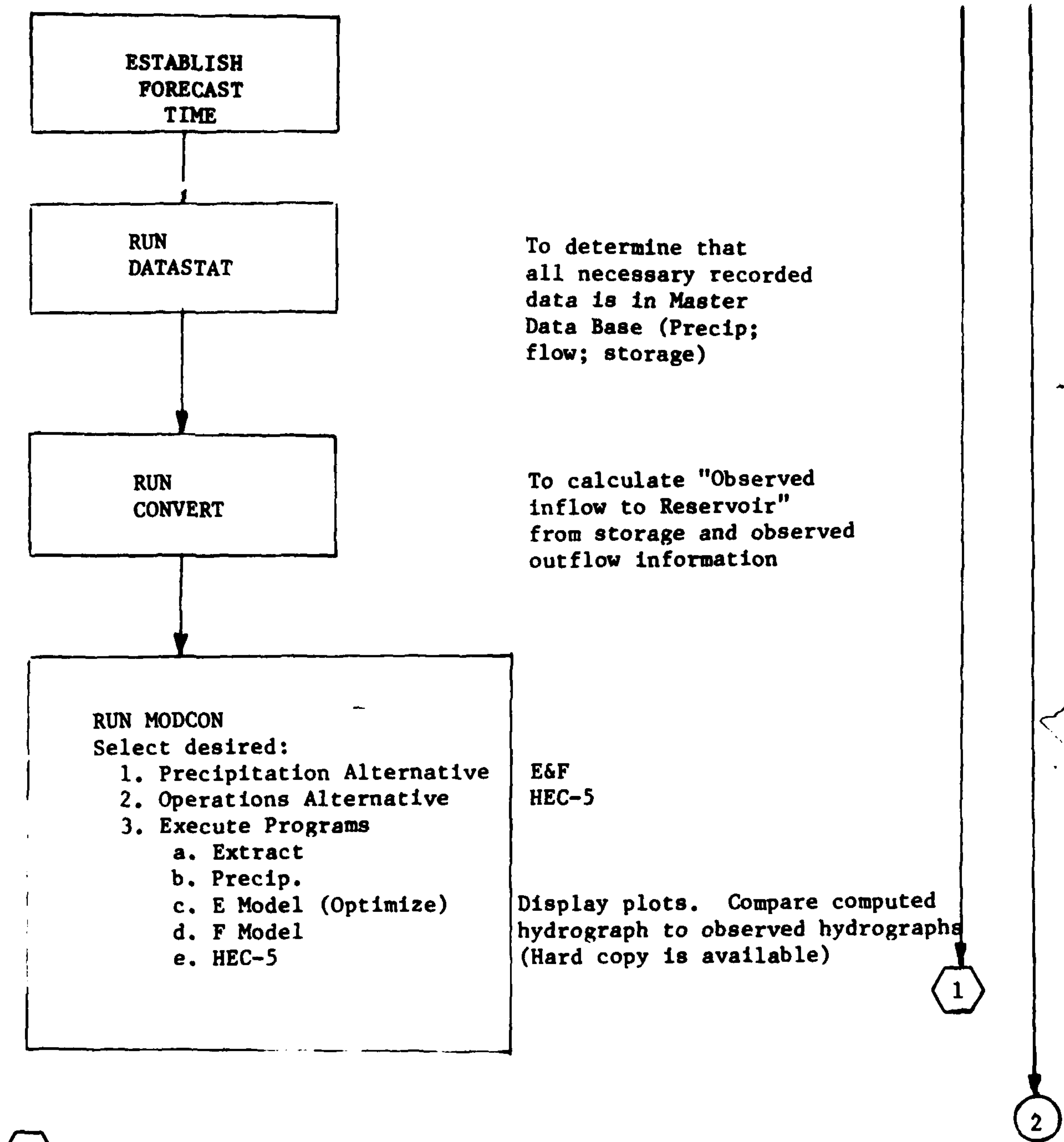
PRECIP - Takes precipitation data stored in Data Storage File by the EXTRACT program and calculates average rainfall on all drainage areas by time period.

HEC-1F (E MODEL) - This is referred to as the "E MODEL" portion of the Real-Time Program. It is applied only to gaged headwater areas such as sub-areas # 63, 65, and 67 in the Grapevine - Lewisville Lakes drainage areas (see figure 1). Observed outflow from these sub-areas are available from streamflow gages. The "E Model" compares the computed hydrograph with the observed hydrograph and can optimize the unit hydrograph parameters to produce the best possible fit between the computed and observed sub-area outflow hydrographs.

HEC-1F (F MODEL) - This is referred to as the "F MODEL". It takes the "Blended" hydrograph (A blended hydrograph consists of the observed hydrograph up to the time of forecast and the computed hydrograph after the time of forecast.) at the headwater area streamflow gage and routes and combines it with downstream sub-area computed run-off hydrographs. In this way an inflow hydrograph into the lake is computed. The unit hydrograph parameters for the downstream sub-areas are not optimized since no observed hydrograph is available for these sub-areas to compare the computed hydrograph with.

HEC-5 - Takes the "Blended" inflow hydrograph for each reservoir and routes it through the reservoir controlling releases as directed by the program for any specified control point downstream.

DSPLAY - This program allows the plotting of several hydrographs on the screen simultaneously. We can therefore plot the "computed" and "observed" hydrographs at any desired gaged point for comparison purposes. A refinement of the intitial values of parameters can then be made and a new optimization process performed if necessary.



1 A recommended procedure is to execute thru the E&F Models and examine plots (results) then

2 Execute again with changes in parameters to get initial forecast - then update at any time desired.

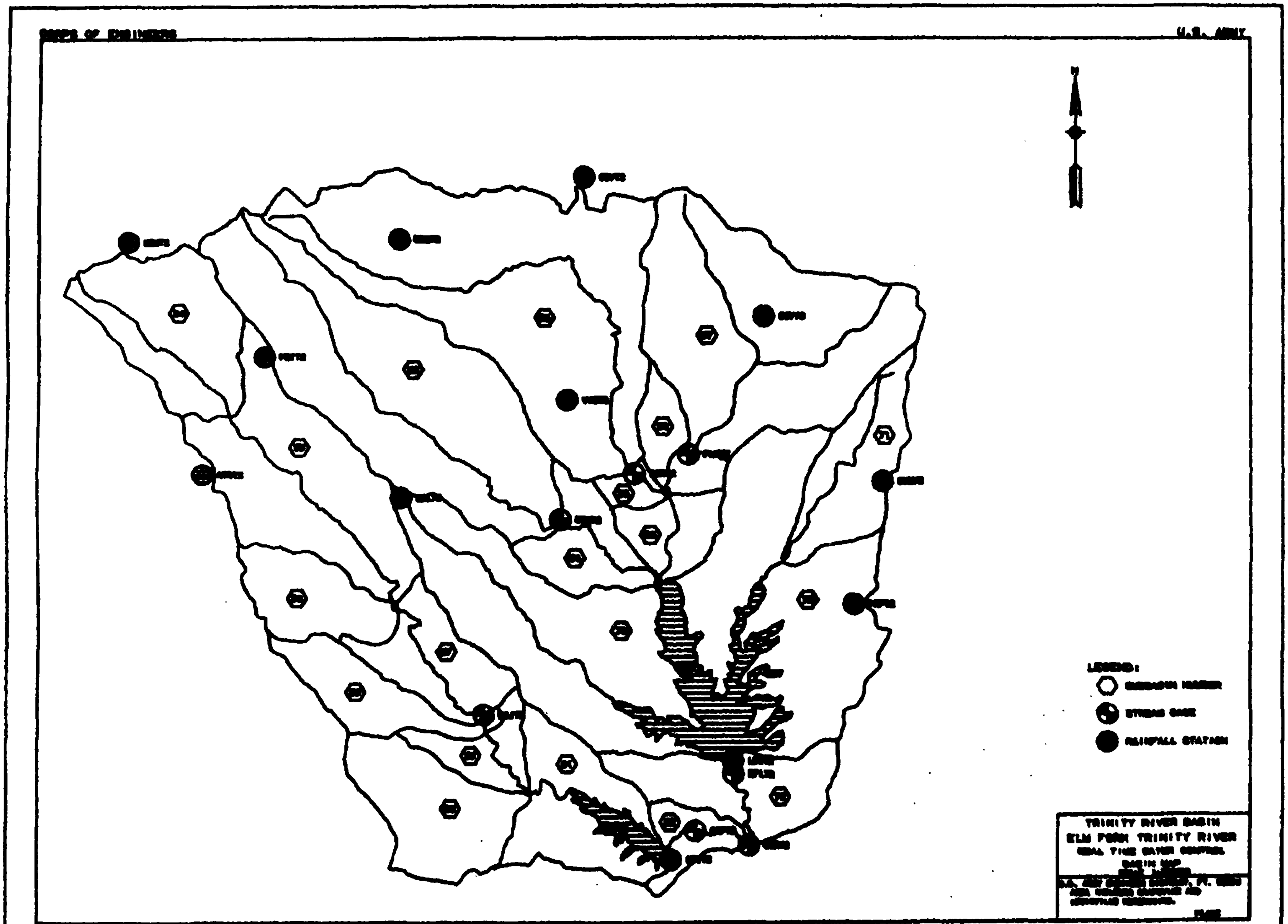

CORPS OF ENGINEERS
U.S. ARMY
N
LEGEND:
SUBBASIN MARKER
STREAM GAGE
RAINFALL STATION
TRINITY RIVER BASIN
ELM FORK TRINITY RIVER
REAL TIME WATER CONTROL
BASIN MAP

FIGURE 1

AGENDA FOR DATABASE PORTION
OF ANNUAL RCC MEETING
14 NOV 84

Maximum of 45 Minutes for Total Presentation.

1. What is a Database and What Does it do for us ? (5 Min.) Lakin
2. What is a Database Management System and What Does it do for us ? (5 Min.) Lakin
3. TOTAL Database Management System (5 Min.) Lakin
   a. What did we get with the purchase of TOTAL ?
   b. What additional software is needed prior to implementation ?
      1. Which of these tasks have beed completed ?
      2. Which tasks are yet to be completed ?
4. HARRIS Data Management Software (DMS). (5 Min.) Lakin
   a. What will it do for us ?
   b. Status of evaluation.
5. SUTRON Contract. (5 Min.) Lakin
   a. Present status.
   b. What will it do for us ?
   c. What SHEF data will it handle upon delivery ?
   d. Documentation.
6. Existing SUTRON Software. (5 Min.) Medlock
   a. What are we doing with it now ?
   b. Experiences.
      1. Problems experienced with implementation.
      2. Does the existing software serve a part of our needs ?
      3. Possible enhancements.
7. HEC'S Data Storage System (DSS) (5 Min.) Medlock
   a. What are we doing with it now ?
   b. Advantages.
   c. Disadvantages.
8. Database Configurations. (5 Min.) McCoy
   a. Advantages and Disadvantages.
      1. Centralization of Master Database at one site under TOTAL and downloading to each site to a TOTAL database.
      2. Decentralization with Master at each site under TOTAL.
      3. Centralization of Master Database at one site under TOTAL and downloading to each site to DSS database.
      4. Centralization of Master Database at one site under DSS and downloading to each site to a DSS database.
      5. Decentralization with Master at each site under DSS.

ATTACHMENT 5

1. What is a database ?

A database is a pool or repository of all data required by an organization. Ideally, each piece of data is stored only once, eliminating the data duplication inherent in traditional methods. All data required by an application is immediately avaliable to it, and several applications may share common information. As a result, data modified by one application is immediately available in its most current form to other applications. Transfer of data from one file to another is no longer necessary. Further, data associated from a collection of interrelated or integrated data files is accomplished efficiently yet with file-by-file independence.

In the scientific and engineering application areas we sometimes forget that we are still in data processing; that is, processing data. Where the requirement exists to update files in place and to relate elements of data together, the criteria of a DBMS becomes as valuable to engineering and scientific users as they are to the business data processing users.

2. What are the criteria of database management systems ?

Each of the following criteria is of critical significance and each is interrelated and interdependent. Each capability is necessary and the absence of only one may adversely and seriously affect the value or worth of the others. For example, without comprehensive and virtually fail safe database integrity, every other feature is of only marginal value.

a. Must Provide for all Data Storage and Processing Requirements.

In the demand transaction oriented environment of terminal based systems there is no faster data retrieval technique than a direct or random approach. Since performance is so critical, this technique should be used whenever possible. However, in a database environment, a file randomly organized may need to be used to satisfy serial, batch-oriented systems as well. Here a random file is a poor performer when compared to perhaps sequential processing. What the user gains in one area he loses perhaps many times over in another. This cannot be tolerated. Historically, indexed approaches have been used as a compromise. Unfortunately, these compromises only insure the user that he will always get less than the best performance in both environments.

Ideally then, techniques should be not only inherently available within the DBMS to satisfy the high performance requests of demand or random processing in an optional fashion but also able to handle batch updating at speeds as fast or faster than sequential processing - without sorting the file or creating one or more intermediate (work) files.

Also, the system designer should not be burdened with developing random algorithms, synonym handling, or disc space allocation and management. Periodic reorganization must absolutely be avoided. Therfore, the files should be self-optimizing after continual deletions and additions of records.

b. Must Be Data Independent at the Data Element or Field Level.

The data storage and data presentation must be independent or transparent down to the data element (data field) level. Only with independence and transparency at the data element level is it possible for users to be responsive to the dynamics of a changing environment. An approach which provides for continuous progress in an evolutionary manner is essential. As new data elements are required, it must be possible to add them to existing records and data structures with no adverse impact on existing operational programs or systems. This should not require rework, redesign, or even recompiling of existing programs.

c. Must Eliminate Data Redundancy.

Exclusive of control information, duplicate or redundant data should not be tolerated. The problems of duplicate maintenance and inconsistencies are already well known from traditional systems approaches. If the DBMS is truly data independent at the data element (data field) level and also provides for flexible data structuring techniques, there will be no need to build redundancy in the database. However, the characteristics of conventional file design techinques virtually force systems to have duplication.

The database must be designed so that multiple entry points, corresponding to different applications and requirements, are available. The data must be organized such that each application can retrieve pertinent information efficiently, yet avoid redundant data.

The usual problem of data redundancy arises because the natural relationships of the information are to complex to conform solely to conventional structures. Some other structure is required to ensure a flexible and efficient database.

A network is one of the most flexible and powerful of data structures. In a network, any element may relate to any number of other elements. In particular, this implies that any number of branches or pointers may enter or leave any element. Thus, the conflicting needs for multiple entry points, for flexible and powerful data structures, and for data non-redundancy within the database are resolved with a network structure.

d. Must Provide Data Integrity and Security.

Data integrity and security are frequently used interchangeably. Although both are considerations, the importance of integrity (protection) is paramount. Every safeguard against hardware malfunction, bad data, programmer or operator error must be anticipated. The DBMS must protect the database, but in the unlikely possibility of error, speedy and efficient restart and recovery techniques must be avaliable. The techniques must function in all environments; multiprogramming, multiprocessing, etc., and must be comprehensive. The critical nature of data integrity cannot be stressed too strongly. IT IS A MUST.

Data security (privacy) should be such that data may be secured at the database, data file, or data element level. Since security will change over time, easy techniques for implementation and modification are essential.

e. Must Be Enironment Independent.

Since the user will evolve over time through a number of environments (e.g. batch, on-line inquiry, and on-line updating) or may be functioning in a number of different environments concurrently, the DBMS must be independent or transparent of environment. Conversion to take advantage of new hardware or new opertins system software technology should be eliminated if possible.

Without freedom to be responsive to the technological breakthroughs as they occur, we will find ourself very shortly frozen into obsolete technology and forced again into a traumatic conversion effort.

The only safeguard against this serious penalty is to be certain that the DBMS approach is one of complete environment, equipment and operating system independence.

f. Must Be Host Language and Equipment Independent.

Selection of a host language (FORTRAN, COBOL, etc.) is made to best satisfy the current and intermediate requirements of the user. Since these conditions will probably exist for some time to come, it is imperative that the DBMS be independent of the host language.

Without independence from a host language at the DBMS level, the user is 'locked in' to todays technology.

g. Must Provide Optimum Performance and Efficiency.

In conventional systems and data file design, much attention is usually given to speed of performance and efficiency of storage space. This is important, even though only new applications or programs may be affected. With a database approach, since all programs and applications are affected, speed and efficiency are imperative. The problems are futher complicated because the objectives typically work against each other - minimum disk and memory space but maximum throughput. Futher, degradation and database reorganization must be avoided - again for the reason all programs are adversely affected in a less than optimum database environment. The DBMS should provide extremely efficient and high-speed performance in all environments.

3. TOTAL Database Management System.

a. What did we get with the purchase of TOTAL ?

The TOTAL Database Management System is simular to conventional programming languages which support various techniques for file and record definition, and various input/output commands for accessing defined data files and records.

The major difference which exists between TOTAL's DBMS and conventional systems is that TOTAL has removed the burden of data definition and access from the host application programming level and incorporated these functions into an independent framework. This framework consists of the following two major components:

1. Data Definition Language (DDL) - a language which provides for the initial generation of a Database Descriptor Module (DBMOD) and all subsequent modifications and expansions to the database, in an English-like language.

2. Data Management Language (DML) - a language which interacts with the database, the host operating system, and the application language (FORTRAN, COBOL, etc.) for all communication with the database.

Data Definition Language (DDL)

Before TOTAL can manage a particular database, it must have a description of the database showing where the various data elements belong in the data records, how the data files are related, and what the physical characteristics of each data file are. When using TOTAL, this information is separated from the application program in the form of an external table, or Database Descriptor Module (DBMOD). The user creates the DBMOD by writing a description of the database in TOTAL Data Definition Language (DDL). These statements are then compiled by the Database Generation Program (DBGEN), assembled, and entered into the program library. To modify either an operational subsystem database or an entire database the user simply defines the changes in the DDL and re-compiles the DBMOD.

Data Management Language (DML)

TOTAL's Data Management Language (DML) provides the means through which an application program can access and manipulate the data-base. TOTAL DML is not a complete language by itself; it relies on a host programming language (FORTRAN, COBOL, etc.) to furnish a framework and to provide the proceedural capabilities required to manipulate the data in primary storage. The user's application program is then actually a mixture of host programming language commands and DML functions. The DML functions at the CALL level.

All CALLs to the database to retrieve, add, delete, or modify data relationships are executed in the TOTAL DML where they are insulated from the host programming language.

TOTAL's DML also features comprehensive safeguards and analytical capabilities to assure proper processing. Diagnostic status codes are provided which indicate success or failure in the execution of a function.

Upon execution of a TOTAL DML command, one or more specific data elements are passed to or from the user program in the same sequence as requested. The user is not required to do any manipulation as to sequencing, positioning, inclusion, or omission of elements; TOTAL handles all this. TOTAL DML functions within the framework of the host operating language to provide specific information from the database. After the host language program has received the data, the application programmer uses the host language for whatever logical, arithmetic, or manipulative processing he wishes.

b. What additional software is needed prior to implementation and which are yet to be completed ?

See attachment.

4. Harris Data Management System (DMS).

DMS.T was developed by Harris Applications Center, a part of Harris Information Systems International, located in Holland. DMS.T is a fully intergrated package foe use with Harris Computer systems and the TOTAL database management system. DMS.T consists of four products: DMS.TR (TOTAL Recovery), DMS.TC (TOTAL Codasyl), DMS.TP (Message processor, DMS.TP (Transaction Processor).

DMS.TR is being evaluated by SWD for its applicability to our database application. This software provides full Transaction Processing and Recovery facilities to TOTAL DBMS users, as well as Quick start, backup, and restore facilities and user oriented menu-driven database operations.

a. Database Operations - is made simple via a user-oriented menu, where all database opertions can be controlled from a terminal. Functions are: start-up database, shutdown database, back-up and recovery, statistics, etc. are available. The daily operation of the database can be under direct control of the user. For back-up and restore functions, DMS.TR applies an automatic tape cycling system.

b. Transaction Processing - With MS.TR one or more database updates can be grouped to create logical transactions. DMS.TR recovers logical transactions after failure, rolls-back logical transaction at the request or at abnormal finish of programs.

c. Logging Mechanism - DMS.TR performs before-image logging, after image logging and in-buffer logging for flying restarts.

d. Recovery Mechanism - DMS.TR provides a two-level recovery facility First there is the flying restart. This on-the-fly recovery is fast and invisible to other current users.
The second level of recovery performs through roll-back and roll-forward proceedures for a complete recovery.

5. Sutron Contract.

a. Present Status - We hope to get a work order out of Vicksburg District during the week of 12 Nov. 84. This work order consists of the following four phases:

1. Phase 1 - consists of studying the differences between the SWD and ORD database design.
2. Phase 2 - consists of modification of the TOTAL support services routines in the data handling package to properly interface with the SWD TOTAL configuration.
3. Phase 3 - consists of the actual modification and testing of the code. A documentation supplement describing the modifications will also be prepared.
4. Phase 4 - consists of the development, testing, and documentation of a SHEF .A decoder. The decoder will be used in conjunction with the existing Engineering Units Program (EUCP) to exchange data between computers in SHEF .A format.

The schedule for completion is 45 calendar days for phase 1 thru 3, and 90 calendar days for phase 4.

b. What will the Sutron Software provide us ?

The Sutron Software will provide the following programs and capabilities:

1. Rating and Conversion Table Program (RTF) - The RTF file contains all of the stream and reservoir tables as well as general tables used by the Engineering Units Conversion Program (EUCP) for parameter conversion. The RTF program allows the user to create, delete, edit, and display rating and conversion tables within the RTF file.
2. Master Configuration File Program (MCF) - The MCF file contains most activities in the Sutron environment. An MCF record is required for every source of data (station) entering the system. Stations include DCP's, manually entered data, and data from external sources (telephone, radio, other databases, etc.). This file is managed by the MCF program which allows the user to create, edit, display, and delete records from the MCF file.
3. Satellite Data Preprocessor Program (PREP) - This program provides the capability to decode messages from DCP's.
4. Engineering Units Conversion Program (EUCP) - This program provides the capability to convert raw incoming data from satellite or manual data entry stations to data in engineering units (feet, degrees C, etc.). EUCP will also look up data in tables for converting stream stage to discharge, reservoir elevation to content, or any other conversion that can be express-ed in tabular form. EUCP will output it's results directly to the SWD TOTAL database.

5. POLL Program - POLL alows the user to retrieve, edit, and save specific data from the short term portion of the SWD TOTAL database. This program is designed to make data retrieval as easy as possible for the user. It is possible to retrieve directly for a single time or period of time at any station or stations. Specific parameter codes may be requested. The POLL program supports user-created command procedures. These procedures allow repeated command sequences (such as generation of a Daily Report) to be reduced to a single command. An optional PLOT command supports graphics from the TOTAL database.

C. Documentation. - SWD presently has 12 copies of the Sutron Documentation. Upon completion of the Sutron contract, the supplement will be added and copies distributed along with the current software.

************ ATTACHMENT *************

TASK	% COMPLETE	EST. MANDAYS TO COMPLETE	POSSIBLE CONTRACT
1. Assemble a sequential file containing the following for all stations within SWD: a. SHEF identifier b. Station name (1[illegible] characters) c. Stream name (15 characters) d. Latitude (Deg.,Min.,Sec.) e. Longitude (Deg.,Min.,Sec.) f. Name of river basin g. Station type (river, lake, etc.) h. Parameters collected i. Drainage area (all stream stations) j. River mile (all stream stations) k. U.S.G.S. identifier l. River basin code m. River basin sub-code	20(2)	20	yes
2. Assemble a sequential file containing the following curve data as shown in enclosure.	10	40	yes
3. Develop program to load station data to database.	75(1)	10	
4. Develop program to load curve data to database.	10	10	yes
5. Develop program to edit any record in database.	10(1)	25	yes
6. Develop program to combine like records in Short Term data file.	80(1)	10	
7. Develop program to convert observed data to either 4 or 6 hourly data and insert in database.	50	15	
8. Develop program to add, list or delete records from station master file.	80(1)	10	
9. Develop program to move data from SUTRON EUCP file to master database and master database to SUTRON EUCP file.	50(1)	15	
10. Develop program to load U.S.G.S. header data as extracted from WATSTORE to master database.	50(1)	10	

(1) Required prior to database implementation.
(2) Partial completion required prior to database implementation.
(3) Included in Harris Data Management (DMS). Development not required if DMS is procured.

NOTE: Estimated effort to complete assumes personnel has extensive knowledge of both the Harris system and Total.

TASK	% COMPLETE	EST. MANDAYS TO COMPLETE	POSSIBLE CONTRACT
11. Modification of HEC's TOTAL-DSS program.	80	15	
12. Develop program to load U.S.G.S. curve data to database as extracted from WATSTORE.	0	20	yes
13. Evaluate HARRIS DATA MANAGEMENT Software and procure if applicable to WCDS.	25(1)	15	
14. Develop program to convert either 4 hourly or 6 hourly data, in STDA file, to mean dailys and write to LNGD file.	50	10	
15. Modify Sutron software now being run in ORD for compatability with SWD database design. this software presently handles the following SHEF parameter codes: a. PP = Observed precip. b. PC = Accumulated precip. c. TA = Observed air temp. d. TX = Max. air temp. e. TN = Min. air temp. f. SD = Observed snow depth g. SF = New snow depth h. SW = Water equiv. - snow i. WP = Water quality - PH j. WC = Water quality - Conductivity k. WO = Water quality - DO l. WT = Water quality - Turbidity m. HS = Pool elevation - Spillway forebay n. HL = Pool elevation (MSL) o. HT = Project tailwater stage p. HW = Project spillway - tailwater stage q. TW = Water temperature r. HE = Height, regulating gate s. NT = Number of DCP Transmission attempts t. QR = Total flow u. QU = Gate flow v. QG = Turbine flow w. YA = Tows above project x. YB = Tows below project y. YU = Tows locked up z. YD = Tows locked down aa. YT = Tow delay time	0(1)	20	presently issuing a work order to Sutron

(1) Required prior to database implementation.
(2) Partial completion required prior to database implementation.
(3) Included in Harris Data Management (DMS). Development not required if DMS is procured.

NOTE: Estimated effort to complete assumes personnel has extensive knowledge of both the Harris system and Total.

TASK	% COMPLETE	EST. MANDAYS TO COMPLETE	POSSIBLE CONTRACT
16. Modify tron software now being run in ORD to handle the following SHEF parameters:			
a. EP = Evaporation, pan increment			
b. EV = Evaporation, lake(computed)			
c. HB = Depth of reading below surface			
d. HG = River stage			
e. HJ = Height spillway gate			
f. HR = Elevation, lake rule curve			
g. HX = height, river stage (max.)			
h. IC = Ice cover			
i. LA = Lake surface area			
j. LC = Lake storage volume change			
k. LS = Lake storage			
l. NG = Total # of gate openings			
m. NU = # of turbines used			
n. PY = Precip., 24HR increment ending 7AM			
o. QD = Canal flow			
p. QI = Discharge - rule curve			
q. QN = Discharge, min. flow			
r. QP = Water supply release			
s. QS = Discharge, spillway			
t. QT = Discharge, computed project total release			
u. QX = Discharge, max. flow			
v. QY = Discharge, river at 7AM			
w. UC = Wind, accumulated wind travel			
x. UD = Wind direction			
y. US = Wind speed			
z. VB = Battery voltage			
aa. VE = Generation, energy total(MWH)			
bb. VH = Generation time (hours)			
cc. WL = Water, suspended sediment			
dd. XW = Weather, present-NWS synoptic code			
ee. YC = Water temp. - lake profile			
ff. YE = DCP freq. error			
gg. YG = DCP time tag			
hh. YM = DCP modulation index			
ii. YQ = DCP modulation quality			
jj. YS = DCP signal strength	0	40	Sutron

(1) Required prior to database implementation.
(2) Partial completion required prior to database implementation.
(3) Included in Harris Data Management (DMS). Development not required if DMS is procured.

NOTE: Estimated effort to complete assumes personnel has extensive knowledge of both the Harris system and Total.

TASK	% COMPLETE	EST. MANDAYS TO COMPLETE	POSSIBLE CONTRACT
17. Develop utility to recover database through rollback/rollforward techniques	0(3)	80	yes
18. Develop utility to backup database.	0(1)(3)	20	yes
19. Develop utility to restore database from backup files	0(1)(3)	20	yes
20. Develop utility to give database statistics (# records in log files, # records in each database file, etc.)	0(3)	20	yes
21. Develop utility to unload database.	0(3)	15	yes
22. Develop utility to reload database from unload files.	0(3)	15	yes
23. Develop menu driven executive program to assist database managers in utilization of utilities described in items 17 thru 22.	0(3)	20	yes

(1) Required prior to database implementation.
(2) Partial completion required prior to database implementation.
(3) Included in Harris Data Management (DMS). Development not required if DMS is procured.

NOTE: Estimated effort to complete assumes personnel has extensive knowledge of both the Harris system and Total.

SUTRON SOFTWARE

The SUTRON data decoding and conversion software package for the Water Control Data System is being utilized throughout the Southwestern Division. The current software package can decode GOES retrieved data from either the SWD Ground Receive Station in Ft. Worth or NOAA/NESS in Wallops Island, Virginia. Converted data is encoded into NWS Shef .A format. The current version of the SUTRON software satisfies most of SWD's data decoding and conversion needs.

Attached is a list of proposed enhancements to the SUTRON software. Some of these enhancements could be completed during the current Vicksburg workorder. All should be completed by additional work order within 3 months after the completion of the above work order.

HEC's DATA STORAGE SYSTEM(DSS)

DSS has been designed to efficiently store time series data. Hydrologic data is stored into DSS in blocks. The size of each block is a function of the time series data interval. For hourly data, each block contains one month's worth of hydrologic data. A pathname is associated with each data block and generally contains six parts (A,B,C,D,E,F) separated by '/'. The usually purpose of each part is:

Part	Purpose
A	Location
B	Station name/SHED id
C	Parameter Type (FLOW, ELEV, PRECIP)
D	Beginning data block time stamp(military style)
E	Data interval (1HOUR, 15MIN)
F	User defined qualifier (OBS)

The following pathname contains monthly flow data for station BCHT2, Trinity Watershed, hourly data interval beginning at 1 November 1984:

/TRINITY/BCHT2/FLOW/01NOV1984/1HOUR/OBS/

Currently, SWD, Ft. Worth, Tulsa and Little Rock Districts are loading SUTRON converted GOES data in SHEF .A format into DSS data bases every 1 or 4 hours. DSS stored data may be graphically displayed on a CRT or processed further by a series of HEC flood forecasting programs.

Some of the advantages and disadvantage of DSS follow:

Advantages

1. Large selection of HEC developed, supported and transportable software which utilized DSS. Includes graphics display program (DISPLAY), flood forecasting programs (PRECIP, HEC-1, HEC-2) and utility programs to manage and edit the data base (DSSUTL).
2. Easy to incorporate HEC supplied DSS FORTRAN subroutines into a user program.
3. Easy to archive data base. Entire data base is contained within one file.
4. Not a real-time data base like TOTAL. DSS requires less system resources.
5. Multiple users may read and or write to the same DSS data base at the same time.
6. A time tag is not stored for each time series data value.
7. Records may be added or deleted from the data base without rebuilding the data base. New stations can be added at anytime.
8. Data base integrity is maintained through program abortions.
9. Data base does not have to be restarted or reintiated across system reboots.
10. DSS data base design prevents redundant data storage.

Disadvantages

1. Written in FORTRAN 66
2. Time series data with an interval less than 1 hour is stored in pathnames containing 1 day of hydrologic data.
3. Written for transportability between different computer systems.
4. All six parts of the pathname must be specified to retrieve a DSS record.

H

PROPOSED SUTRON SOFTWARE ENHANCEMENTS

1. Incorporate HEC's ASGN subroutine call from HECLIB into all programs to allow the definition of file assignments and program options on the program execution line.

2. Place the FORTRAN source of each program's subroutines under a separate qualifier using a unique filename. Make each subroutine name unique. Store the link ready version of each subroutine for all programs into 1 library.

3. For the MCF, RTF, and MDE programs, allow the user to specify only the first 2 characters of any command name and/or any applicable parameters/arguments.

4. Modify the maximum numbers of stations in the MCF and PTF data bases from 150 to 500. Place this variable in a common block for easier modification in the future.

5. Allow the MCF program to combine 2 MCF data bases into 1. Allow the RTF program to combine 2 RTF data bases into 1. Make the assumption that the data bases to be combined do not neccessarily have the same maximum number of stations.

6. When the NOAA/NESS id is changed in the MCF data base, the MCFKEY file is not resorted and saved.

7. Allow MCF to generate a summary of station name, NOAA/NESS id, alternate id, full station description, and user defined fields by station sorted by either station name, NOAA/NESS id or alternate id.

8. Allow the user to change the station name in the RTF file.

9. Modify the common block name for KEYDATA to MCFKEY and RTFKEY,respectively, depending on whether the calling program needs key data from MCF or RTF.

10. Combine the PREP and EUCP programs into 1 program.

11. Modify PREP to read Synergetics downlink raw data formatted messages.

12. The format used by PREP to write messages to Syslog is 2 characters too short.

13. PREP does not easily decode Synergetics DCP messages with a "#" sign in column 1 of each message line when there are more than 8 values of a specific parameter measured.

14. Modify PREP to read messages as retrieved from a NOAA/NESS 300 baud transmission instead of depending on a character count on each data line.

MINUTES
Hydrologic Engineers Conference
Southwestern Division Office
15 November 1984

1. A conference addressing the hydrologic engineering concerns within the Southwestern Division (SWD) was held in Dallas on 15 November 1984. An attendance list is attached as Attachment 1. Attachment 2 outlines the agenda for the conference. The topics are summarized.

2. The meeting begin with Mr. Ralph Hight of the Tulsa District reporting on the status of the Hydrologic Modeling Center, which was set up in July 1983. The center is at full strength (five employees). The Little Rock, Fort Worth and Tulsa Districts have utilized the services provided by the center. Types of studies conducted by the center are hydropower, river system regulations and interior drainage analyses. Mr. Hight told the other districts that request for services should be submitted early in the Fiscal Year to the Chief, Engineering Division, Tulsa District. Mr. Ron Hula, SWD, reported on the status of the SUPER Models. He stated modeling has been conducted on the Arkansas, White, Red, Trinity and Colorado basins. He also asked the districts to look at their budgets to see what work could be scheduled for the Modeling Center.

3. Mr. Loren Pope, Tulsa District, presented their concern about the procedures used for synthetic discharge frequency curves. The Great Bend project has suffered some problems with storm patterns. It was agreed, if possible, to calibrate all TP-40 rainfall procedures with gages in the area. As one alternative calculate the ratio of TP 40 rainfall to PMP, then use the PMP elliptical pattern with tne adjusted rainfall. The synthetic discharge frequency curves procedure should be verified at several gages in the region.

4. Reservoir freeboard criteria concern was presented by Mr. Loren Pope of the Tulsa District. It was agreed that adequate guidance is presented in EC-1110-2-27, policies and procedures pertaining to determination of spillway capacities and freeboard allowances for dams.

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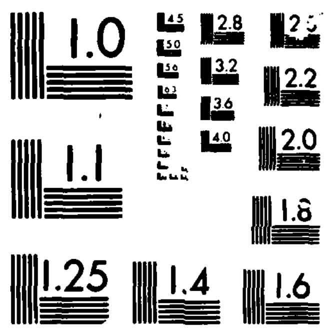

MICROCOPY CHART

5. Mr. Ron Hula, SWD, indicated there has been a great deal of interest in regard to interior drainage analysis. Two computer program (Joint Probability Method and Period of Record Methods) have been developed by SWD for district use.

6. Mr. Sam Bates, SWD, reviewed ETL 1110-2-305, Determining Sheltered Water Wave Characteristics. The following guidance was provided.

A. Additional process that must be represented in windspeed.

(1) Estimating maximum winds. - Use same procedure as before in lieu of actual records. Determine 1-hour and fastest mile values from figure 4 of the guidance provided by SWD in August 1979.

(2) An average fetch rather than effective fetch will be used for sheltered water bodies. It should be radially averaged over an arc of 24 degrees centered on the wind direction. Example provided in figure 1.

(3) **Stability Adjustments:**

(a) Overwater Adjustments. - - For fetches less than 10 miles apply 1.1 factor. For fetches greater than 10 miles use figure 2.

(b) Air-Sea Temperature Difference. - - Use figure 3 to make further adjustments to windspeeds to account for air-sea temperature difference. When only general knowledge is known use the following criteria.

Stable - When the air is warmer than the water, the water cools the air just above it and decreases mixing in the air column ($R_T = 0.9$).

Neutral - When the air and water have the same temperature, the water temperature does not affect the mixing in the air column ($R_T = 1.0$).

Unstable - When the air is colder than the water, the water warms the air causing the air near the water surface to rise thus increasing mixing in the air column ($R_T = 1.1$)

An unstable condition, $R_T = 1.1$, should be assumed when the boundary layer condition is unknown. Having a value for R_T, the adjusted windspeed is determined by $U_C = R_T U_W$.

4. Windspeed - Duration Curve: Conversion factors are provided to convert windspeeds up to 6-hr durations. Report development of windspeed-duration curve for several wind directions to ensure critical combination of adjusted windspeed, duration and fetch are obtained for forecasting the design wind. See Figure D-2

B. Use figure 4 to predict design wave height and period. These curves are based on revised equations from the IONSWOP field studies. Procedures for computing deepwater wavelengths and wind set-up remain the same. Shallow water tested procedures remain the same. When shallow water conditions occur use applicable curves along with the previously computed design windspeed and fetch.

7. Mr. Hon Hula, SWD, presented two methods (Kelly and Stall) of determining storage yield at Corps Lakes at two levels of dependability. The studies that were presented were for the purpose of evaluating the reliability of both methods.

WATER MANAGEMENT BRANCH
ANNUAL MEETING - 15 NOV 84

J. Leon Curtis	SWDED-WH
T. Schmidgall	SWDED-WA
Arnoldo Escobar	SWFED-HL
Tom Johnston	SWFED-HH
Ron Hula	SWDED-WH
Frank Jaramilla	SWAED-PH
Bill Isaacs	SWLED-H
Ross R. Copley	SWTED-HR
Loren Pope	SWTED-HE
Ralph Hight	SWTED-HC
Charlie Sullivan	SWD
Ed Reindl	SWGED-HC
Jim Kosclski	SWGED-HC
Jim McCoy	SWTED-HS
Terry Coomes	SWDED-W
Jim Medlock	SWFED-HH
Jim Proctor	SWLED-HR
Carroll Scoggins	SWTED-H
Sam Bates	SWDED-WH

Attachment 1

AGENDA

1984 Hydrology Meeting

Water Management Branch

Southwestern Division

Corps of Engineers

15 Novembet 1984

Hydrology Topics		**Time**
I.	Hydrologic Modeling Center	8:00 a.m.
	A. Report on Status of HMC - Mr. Ralph Hight (TD)	
	B. Status of SUPER models - Mr. Ron Hula (SWD)	
II.	Synthetic Discharge - Frequency Curve Procedures - Mr. Loren Pope (TD)	8:30 a.m.
III.	Reservoir Freeboard Component Analysis - Mr. Loren Pope	9:00 a.m.
IV.	Interior Drainage Analysis	9:30 a.m.
	A. Joint Probability Method - Mr.Ron Hula	
	B. Period of Record Method - Mr Ron Hula	
V.	Break	10:00 a.m.
VI.	ETL 1110-2-305, Determining Sheltered Water Wave Characteristics - Mr. Sam Bates (SWD)	10:15 a.m.
VII.	Simultaneous Storage Yield Analysis at Two Levels of Dependability - Mr. Ron Hula	10:45 a.m.

Attachment 2

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